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EKO: ECONOMICS AND ORGANIZATION

OF INDUSTRIAL PRODUCTION

No 4, APRIL 1986

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23 JULY 1986

USSR REPORT ECONOMIC AFFAIRS

EKO: ECONOMICS AND ORGANIZATION OF INDUSTRIAL PRODUCTION

No 4, April 1986

Except where indicated otherwise in the table of contents the following is a complete translation of the Russian-language monthly journal EKONOMIKA I ORGANIZATSIYA PROMYSHLENNOGO PROIZVODSTVA published in Novosibirsk.

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SYSTEMATIC APPROACH IN ECONOMIC IMPROVEMENT STRESSED

Novosibirsk *EKONOMIKA I ORGANIZATSIYA PROMYSHLENNOGO PROIZVODSTVA* (EKO) in Russian No 4, Apr 86 pp 25-39

[Article by G. A. Yegiazaryan, doctor of economic sciences, professor, Moscow State University imeni M. V. Lomonosov: "From Experiment to Integrated System"]

[Text] The need for a comprehensive approach to improving the economic mechanism is determined by the high degree of interconnection among all units and levels of the modern economic mechanism, which make it unthinkable to have changes in one of its elements without restructuring the entire system. As the experience of the 1965 economic reform shows, this is precisely what caused the inadequate effectiveness of the implementation of individual partial decisions for improving the economic mechanism. A condition for realizing the developed system is the existence of general national economic prerequisites for its functioning, whose absence or inadequacy will cause the system to "run idle."

The most important of these prerequisites is the balance of the economy. Only with balance is it possible to create an economic mechanism that is based on a five-year plan; the utilization of value levers—profits, prices, long-term normatives—in the system of economic incentives; a system of economic circulation without shortages, which provides for economic control on the part of the consumer over the producer. Therefore we need a long-term strategy for changing the economy over to a balanced condition, and an important step is being taken in this direction under the 12th Five-Year Plan. Thus in addition to the concept it is expedient to define also the national economic prerequisites for its utilization as an important part of the program for improving the economic mechanism.

An important direction in the development of the concept of improving the economic mechanism is the creation of a special system for controlling the changeover from the previous system of management to a new one and a system for controlling the introduction of the complex of measures for improving the economic mechanism.

It seems that one of the most important reasons for the slow and half-hearted introduction of the complex of measures developed in recent years consists in

the lack of special organizational structures, methods of control and stimuli which provide for this changeover and for the introduction of the system. A certain "vacuum" has formed in the system of economic control.

The system of planning, evaluating, financing and stimulating is effective with a sharply differentiated set of conditions for management of enterprises and associations that are operating under the old and the new conditions. In particular, delay in the changeover to new conditions as compared to the directive plan-schedule and their incomplete introduction, regardless of "who is guilty," should automatically sharply deteriorate the economic position and the evaluation of the activity, and reduce the incentive funds for the associations and the branch system as a whole. During the transition period, for example, it would be possible to resort to a two-scale system of calculated wholesale prices, which are used for evaluating the results of the economic activity of the enterprises that are operating under the old and the new conditions, a system of rebates from wholesale prices, differentiated normative for distribution, profit, fund formation and so forth. This problem is, of course, debatable, but its principal significance consists in that this vacuum which has been formed at the present time and which is impeding the changeover to the new system of management should be filled.

An integrated system of management, in our opinion, encompasses the following kinds of basic blocks: the organizational structure; planning; financing; economic incentives, and responsibility. The initial one is the block of organizational structures.

Organizational structures are the "bearing walls" of the economic mechanism. The economic mechanism is naturally projected onto a particular type of organizational structure and this type determines the content of all the rest of the blocks of the economic mechanism. We have a contradictory situation here: on the one hand the long-range plan for the organizational structure is formed on the basis of a new basic production unit--the production association, and, on the other, the development of the new system of management proceeds with a certain amount of separation from the organizational structures and is not "bound" to them. For example, in the large-scale economic experiment which has been conducted in a number of branches of industry they have used practically one and the same system of expanded independence both for the giant of heavy machine building and for the small association in the republic's local, light or the food industry. It is necessary to surmount this disparity and to develop first and foremost a new organizational structure in the branch, regional and program aspects, and all the other blocks of the system should be developed on the basis of this.

The preparatory measures for improving organizational structures are an important step. The main tasks in this area were defined in the report from General Secretary of the CPSU Central Committee M. S. Gorbachev at the Conference on Scientific and Technical Progress (June 1985). These include the creation of agencies for control of large national economic complexes, the elimination of excess units, the reduction of the management apparatus in the branches, a change in the role and functions of the ministries, integration and concentration of management, an increased role for the basic unit and, as a rule, its subordination directly to the ministries. A number of these

measures have already been carried out. In particular, the CPSU Central Committee and the USSR Council of Ministers adopted a decree concerning measures for improving leadership of the branches of machine building.¹ In keeping with this decree it is envisioned to form a bureau of the USSR Council of Ministers for machine building which is the agency for managing the machine-building complex, coordinating the development of its individual branches and conducting a unified scientific and technical policy.

The second block in the system is planning. A leading part of the restructuring of the entire economic mechanism is to increase the role of the five-year plan, to transform the five-year plan into the major form of planning and the basis for the organization of economic activity. Now, during the process of the development of the 12th Five-Year Plan, the question can be put only as follows: either the 12th Five-Year Plan will be the basis for the new economic mechanism and this is one type of economic mechanism for the future or the basis will be the annual plan—in this the economic mechanism will be of another type.

The question of which of the two paths to take from here acquires principal importance for the development of the system and the answer to it determines the type of system, its content and the degree of its stimulating influence on the reproduction process and the growth rates. The experience of the economic reform makes it possible to draw a conclusion: only the five-year plan can be the basis of the modern type of economic mechanism. At the same time the experience of the reform makes it possible to draw another conclusion as well: the current type of five-year plan with its "rigid" and cumbersome structure cannot be the basis. Indeed, beginning with the 8th Five-Year Plan we have been designing a system of management whose basis is the five-year plan. But in reality, in practice, because of the fact that the five-year plans have not been stable, this system has been "adapted," to a certain degree randomly, to the annual plan—within the framework of the annual plan we have formed the indicators, normatives, resources, balances, rates, proportions and wage funds. Therefore in order to have a real restructuring of management on the basis of the five-year plan it is necessary to replace the rigid and cumbersome system of the five-year plan with a new one which is flexible and elastic.

In what areas can this work be done?

In the first place, the problem of forming a more flexible and elastic structure of the five-year plan is primarily a problem of expanding the operational and economic independence and sharply reducing the number of centralized planning indicators. The need to solve this problem was emphasized in the report by Comrade M. S. Gorbachev at the Conference on Scientific and Technical Progress.

The second direction is the changeover to the "fork" in the plan with those basic indicators which will characterize the main parameters of the economic activity of the production units and ministries.

Third is the creation in the plan of a system of reserves for all kinds of resources, which makes it possible to adjust the plan without changing the proportions.

Fourth is a sharp expansion, beginning with the 12th Five-Year Plan, of the sphere of normative planning which by its nature corresponds to a greater degree to the flexible and elastic structure of the five-year plan and the cost accounting [khozraschet] understanding of stability. The long-term normative that characterizes the level of the utilization of one resource or another can be established not in the form of a concrete fixed amount, but in the form of a particular pattern of its change, depending on the base indicators. The dynamic nature of the normative and its link with the base indicator will largely improve the approach to the five-year plan and give it flexibility and elasticity, which will make it possible to make the necessary adjustments in the plan without changing the proportions and indicators.

Stability, as the decisive condition for the utilization of the five-year plan as the basis of the economic mechanism, can be achieved only within the framework of this type of flexible and elastic five-year plan, but here the very concept of stability changes and a new cost-accounting interpretation of its content can be suggested.

The solution to the following problem is very important from the standpoint of the cost-accounting interest of the production unit. When developing the five-year plan and during the course of its implementation on the basis of a limited quantity of stable economic "rules of behavior" that are given in the plan (indicators, normatives and stimuli) the production unit must simply determine the changes in its economic position (resources left at its disposal, the wage fund, and so forth) when selecting one or another variant of development or changing over to the output of new products. Moreover, as was noted below, the indicators are given not as a single amount, but in the form of "forks," normatives—through a particular pattern of their change.

During the course of their fulfillment individual planned assignments can be changed and refined, but the stability of the conditions that determine the results of the decisions that are made will remain. Thus we are speaking not about stability of the plan in the sense of its unchangeability, but about stability of conditions that establish the distribution of resources, profit, and the amounts of the wage fund.

The dependence of the economic position on the management decisions that are made on the basis of the stable, unchanging conditions and "rules of behavior" is the initial point of the cost-accounting interest of the collective in increasing the effectiveness of production.

An important block of the system is composed of economic incentives and responsibility, and this includes material incentives. During the course of the economic reform it was suggested that we change over from the principle of incentives "for the plan," its fulfillment and overfulfillment, to a new principle—incentives "for the level and growth of indicators" envisioned in the plan and the degree of the fulfillment of the plan with respect to these indicators. This new principle should link the level and growth of the

indicators in the plan to the amounts of the incentive funds. The system of formation of incentive funds should provide for this dependency.

But because of a number of factors this principle has "not worked" and the system of fund formation has been replaced by a system of "fund adjustment," whereby the indicators have determined not the absolute amount of the fund, but their deviation from the absolute amounts adopted in the five-year plan. Moreover there was a complete revival of the principle of incentives for fulfillment and overfulfillment of the plan. This system of fund adjustment, which remains up until the present time, does not have any serious stimulating effect.

Since problems of stimulation were not fully resolved along the line of incentive funds, it is even more crucial to strengthen stimulation along another line—salaries and rates. The first step in this direction has been taken: during the course of the experiment a system of increments to wage rates and salaries for occupational mastery was introduced. Giving the wage rates and salaries more flexibility and linking them to the results of the work constitute a future direction in the development of stimulation and it will be worthwhile to proceed further in this direction. Certain measures can be suggested regarding this.

First, it would be expedient to expand the limits of differentiation in the levels of salaries and wage rates for each position and between positions (categories) of industrial production personnel and to determine the maximum possible degree of differentiation. Here salaries should be regulated, as envisioned, within the limits of the wage fund.

Second, it is necessary to expand and more fully utilize the rights of the enterprise to establish increments to the salary (wage rate) from savings on the wage fund.

Third, it would be expedient to give the enterprise the right, within the limits of the "fork" of salaries, periodically not only to increase, but also to reduce the amount of the salary; and also to revise the amount of wage rates, depending on the results of the work.

Fourth, expansion of the rights of the enterprises to regulate the amounts of wages could be expediently reinforced by an expansion of the rights to regulate the movement of personnel within the enterprise, retraining, and the release of excess numbers, and also workers who are not performing their duties. This is a measure which provides economic levers for discipline and organization.

It should be emphasized, however, that the system of incentives which envisions increments and bonuses for improvement of work is one aspect of the system of levers for increasing the role of the labor collectives. Another, so far less developed aspect of it, is the system of economic responsibility which determines for the collective and each worker the economic need to improve their work. In our opinion, it is necessary to create a special mechanism of economic responsibility of the collective and the worker which is based on socialist principles and would determine this need. The development

of such a mechanism, it seems to us, should become one of the most important sections in the program for improving the economic mechanism. Measures for increasing the economic effectiveness for industrial ministries, supply agencies, associations and enterprises for the failure to fulfill delivery plans are an important step in this direction.

The Position of the Experiment in the Overall System of Improvement of the Economic Mechanism

It seems expedient to consider a number of fundamental problems related to the further development of the large-scale experiment that has been conducted in a number of branches of industry.

Here it is important to take two circumstances into account. First, the experimental system should be evaluated in light of the general concept of improvement of the economic mechanism. Second, it is necessary to take into account the experience of the economic reform, during the course of which a certain amount of work had already been done for expanding the economic independence of production associations (enterprises).

From these standpoints it would be expedient first and foremost to determine the qualitative peculiarities of the experimental system, which is a new stage in the development of democratic centralism in management as compared to the system that was introduced in 1965. The innovation and the peculiarities of this stage are linked both to the advancement of new principles and to the creation of conditions for more complete realization of already existing principles.

The comprehensive approach. The restructuring should embrace not only the level of the basic production unit, but the entire system of management (when the economic reform was conducted in 1965 the restructuring, as we know, did not encompass a system of management of the branch along the vertical). But in this stage of the experiment the middle and higher level of branch management have not been restructured, and this is already exerting a retarding influence on its development.

The restructuring cannot be reduced only to an expansion of rights. It also includes the temporal aspect. Expansion of independence is carried out on the basis of the framework of the five-year plan (under the conditions of the 1965 reform—mainly on the basis of the annual plan).

Transforming the five-year plan into the basis for the organization of economic activity should be accompanied by a real reduction of the number of centralized planned indicators and a greater orientation of the entire system of the plan toward the final result—deliveries, effectiveness and quality.

The provision of a guaranteed (within the framework of the five-year plan, on the basis of stable normatives) dependency of the final results on the amounts of resources which the production association (enterprise) receives. Under the conditions of the reform this dependency was weakened—statically it was reflected in the equalizing approach to the formation of the unit resources, and dynamically—the dependency was limited to framework of the annual plan.

The guaranteed nature of the allotment and receipt of "earned" resources and their material and technical support.

A system should be created for the management of the entire totality of commodity and value forms--prices, profit, indicators, normatives and other economic levers.

Expansion of the independence and rights of the enterprise in the system of cost accounting relations upward along the branch vertical--particularly among units of branch management.

Strengthening the stimulating role of the salary and the wage rate: ensurance through the system of increments (received as a result of economizing on the wage fund) of the dependency between the results of the work and the level of the salary (wage rate), and their greater flexibility and differentiation on this basis.

Improvement of the System of Material Incentives

It seems expedient to consider the problem of increasing the stimulating role of the wage rate and salary, and also the system of fund formation. It is apparently necessary to augment the system of increments to salaries and wage rates that has been introduced with a system of rebates--for deterioration of the indicators of work the amount of the salary (wage rate) should be reduced by 20-30 percent for a certain period. This would increase the worker's economic responsibility for the results of his activity.

One can observe a certain disparity in the movement of the wage fund (it is made dependent on the normative net output) and the material incentive fund (which depends to a certain degree on the fulfillment of the plan for deliveries). As a result, when there is a failure to fulfill the plan for deliveries the corresponding reduction of the incentive fund can be covered by the increase in the wage fund as a result of increasing the volume of the normative net output. This weakens the incentives for fulfilling the delivery plan. It would be expedient to link the movement of the wage fund to the fulfillment of the delivery plan as well.

There has also been a disparity between the movement of the incentive fund and its force--profit. Profit is planned in the annual plan, but the part of it that goes into the material incentive fund is planned in the five-year plan; the movement of profit and the material incentive fund are determined by different factors. As a result, in a number of cases the enterprises can end up without a source for the formation of incentive funds. Therefore it would be more preferable to change over to a different system of fund formation whereby the fund-forming factors are more closely linked to the source--profit. One possible example of this approach is the system of fund formation which is constructed from direct deductions into the fund from savings on all kinds of resources--material, labor and production capital. This approach is preferable to the current system of fund-forming indicators, the main of which is the production cost. The production cost is not a very mobile indicator and its utilization essentially stabilizes the amounts of the incentive funds.

The advantage of the proposed approach lies in the fact that it makes it possible to more actively stimulate the growth of labor productivity (in the experiment labor productivity was generally not represented in the system of the material incentive funds).

Improvement of the System of Release and Utilization of Labor Resources

If the stimuli for increasing labor productivity envisioned in the experiment are working, then part of the surplus labor force should be released, redistributed and used in other sections of the national economy. To do this it is necessary to create a mechanism which consists of two elements.

The first should provide the possibility, as a result of increasing labor productivity, of releasing and eliminating some of the personnel. Additionally, the enterprise should be relieved of the responsibility of finding work for the workers it discharges. Their planned redistribution, retraining and utilization should be the function of the second element of the mechanism—a centralized state system which could be created on the basis of the USSR State Committee for Labor and Social Problems and regional bureaus for labor placement of the population.

The experiment and the restructuring of the work of the upper echelons of economic management.

The changeover from the experiment to an integrated system of management and control requires a restructuring of the work of the upper echelons of management as well. The experiment touches upon the level of the basic unit and so far does not encompass the vertical axis of the branch. Because of the changeover to a primarily two-unit system of management and the elimination of the all-union production association there arises a question of the nature of cost accounting ties between enterprises and ministries. The elimination of detailed supervision of enterprises and the expansion of their operational independence require a cost-accounting basis for their interrelations along the vertical.

An important element of the cost-accounting relations in the branch could be the five-year economic agreement concluded between the enterprise and the ministry which would define the cost-accounting commitments of the two parties for fulfilling five-year planning assignments. It would be an important addition to the system of centralized plan-directive management. The object of the agreement which would be concluded for 5 years would be the five-year plan-order for the production of products in a given assortment, volume, and of a particular quality, the system of mutual commitment to the two parties for its fulfillment, and cost-accounting stimuli and responsibilities.

Improvement of the System of Planning

A central task here is to increase the role of the five-year plan and transform the five-year plan into the major form of planning as well as the basis for the organization of economic activity. The Basic Directions for the Economic and Social Development of the USSR During 1986-1990 and the Period Up to the Year 2000 note the need to increase the role of five-year plans in the

organization of economic activity at all levels. The expansion of the rights of production associations and the changeover to five-year planning are two sides of one coin, since expanded independence actually, in reality, can be carried out only within the framework of the five-year plan. Here the five-year plan is not an artificial "makeweight" to the system which could be done without, but an organic constituent part, a natural temporal aspect of the expansion of independence.

Herein, it seems to us, should lie the essence of the principally new approach to the expansion of independence under the conditions of the given experiment, and this is precisely what distinguishes this experiment from efforts made in preceding years to solve the problem of expansion of independence which were essentially on the basis of the annual plan.

In the experimental system there are essential reserves for strengthening the positions of the five-year plan. In the first place, in the five-year plan that is being established for the experimental branches there is no financial aspect, including profit and normatives for its distribution. The normative-shared method, which has been introduced in these branches and should be based on planning profit in the five-year plan and the corresponding long-term normative for its distribution, is represented only in the annual plan. But with the elimination of the long-range normative one forfeits the stimulating role of the normative-shared method, and it is retained under these conditions only as a form of removal of profit which has no cost-accounting content. And this means that the stimulating role of profit and its levers, which have been weakened in recent years in any case, are undermined even more. Therefore it would be expedient to plan the amount of profit and the normatives for its distribution in the five-year plan with a distribution of the assignments for the various years, having excluded these from the annual plan.

In the second place, most of the centrally planned indicators are represented not in the five-year plan, but in the annual plan. If the "center of gravity" in planning with the given range of planned indicators depends on their distribution among five-year and annual plans. Therefore the existing situation objective increases the role of the annual plan and weakens the role of the five-year plan. Therefore it would be expedient to redistribute the indicators, concentrating the main ones in the five-year plan and, correspondingly, excluding them from the annual plan.

In the third place, a number of indicators—labor productivity, production costs, proportion of products of the highest quality category, and others—are duplicated in the five-year and annual plans. This duplication also weakens the role of the five-year plan. Therefore it would be expedient to eliminate this duplication, leaving these indicators in the five-year plan.

In the fourth place, in the experimental system there has been no essential real reduction of the number of centrally planned indicators, without which independence is impossible. Therefore it would be expedient to continue the process of reduction.

Here it is necessary to take into account the experience of the economic reform. In its first stages—under the 8th Five-Year Plan—the number of

indicators planned centrally for the enterprise was reduced to approximately one-fourth the previous amount. But then their number increased again. The fact is that the load which was previously carried by centrally planned indicators had to lie on the new levers and stimuli, but it turned out to be too much for these levers.

In the experiment that is being conducted, with a reduction of the number of centrally planned indicators there should be introduced effective systems of incentives for the growth of these indicators. Without this condition, as the experience of the 1965 reform shows, it will be extremely difficult to expand independence in planning.

The agreement would determine the economic responsibility of the ministry to the production associations for the quality and time periods for submitting the plans, the stability of the given indicators and normatives, the allotment of the necessary funds and resources for the plan, the adherence to a unified technical policy, work for the development of production, and so forth.

The reciprocal responsibility of the production association to the ministry would be reflected in the fulfillment of the plan-order and in the effective utilization of the resources.

The system of mutual responsibility should be based on a fairly rigid system of sanctions which envision reimbursement for harm that is caused to a given unit and material responsibility of each worker for the results of the decisions he makes. This system of responsibility for the fulfillment planned commitments should be arranged on new principles which include a broad range of measures both for workers (from payment of fines, deprivation of bonuses, reduction of salaries, transfer to lower paid work to the firing of workers who are not performing their duties without giving them the right to hold management positions for a particular period of time) and for the production collectives (from the reduction of incentives, including the wage fund, the deterioration of the financial condition to structural rearrangement of the associations and enterprises under a planned policy, changes in their production specialization and, as an extreme measure, used as an exception with the permission of the directive agencies—disbanding, closing or including them in other associations). The material basis for this type of agreement should be centralized funds and reserves of the ministries which are created from deductions from the enterprises and associations and also the funds and reserves of these latter.

In this case it would be expedient also to change the system for the functioning of centralized resources of the ministry through changing it over to a credit basis. The agreement should also envision a special system of material incentives for the fulfillment of commitments by the size, which would link the amount of the wage funds and material incentive funds to the results of the work of the enterprises and the ministries.

In keeping with the distribution of the assignments of the five-year plan among the various years, the agreement could also contain the distribution of commitments among the various years—in this case the results of the fulfillment of the agreement would be monitored in the annual cross-section.

The point of the introduction of the aforementioned economic agreement would be to make the ministry more active in cost accounting operations and include it in the experiment. At the same time it would be possible to solve the problem of cost-accounting support for the fulfillment of the assignment of the state plan.

Realizing the proposals presented above, it seems to us, would make it possible to a certain degree to facilitate and regularize the changeover from the experiment to an integrated system of management.

FOOTNOTE

1. PRAVDA, 18 October 1985.

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KRIOGENMASH NPO OPERATIONS REPORTED

Novosibirsk *EKONOMIKA I ORGANIZATSIYA PROMYSHLENNOGO PROIZVOODSTVA* (EKO) in Russian No 4, Apr 86 pp 40-41

[Introduction to materials that follow: "Kriogermash NPO: The Return Could Be Increased!"]

[Text] The 27th CPSU Congress envisioned expansion of the network of scientific production associations, directing them toward the creation and extensive introduction of new generations of equipment and technological complexes as well as constant improvement of technical equipment and production technology.

The experience of the Kriogermash Scientific Production Association shows that with improvement of the management methods it is possible to significantly increase the return from the NPO and to reduce the time period for the development and assimilation of new technical equipment.

Because of the creation of an integrated system of management of the NPO, the organization of all-encompassing planning of the work on new products, the assignment of responsibility for each new item to the leading designer who has been given the rights and authority of the manager of a target program, and because of many other organizational and economic innovations during the past 10 years Kriogermash workers have managed to reduce the time periods for the assimilation of new products to two-fifths of what they were. The economic effect from scientific research and experimental design developments has amounted to 5.22 rubles per ruble of expenditures.

One should draw attention to another aspect of the experiment in Kriogermash—the thrifty and consistent utilization of the achievements of fundamental science. This makes it possible to create technical equipment that is produced on a worldwide level. Our country does not have to import

refrigeration equipment and the Kriogermash NPO exports it to 10 foreign addresses, including economically developed countries.

Read in this issue the selection of materials about the Kriogermash NPO.

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NEW TECHNICAL EQUIPMENT CONTINUOUSLY CREATED

Novosibirsk *EKONOMIKA I ORGANIZATSIYA PROMYSHLENNOGO PROIZVODSTVA* (ENO) in Russian No 4, Apr 86 pp 41-57

[Article by V. P. Belyakov, Hero of Socialist Labor, corresponding member of the USSR Academy of Sciences, general director of the Kriogenmash NPO (Balashikha, Moscow Oblast): "The Continuity of the Process of Creating New Technical Equipment"]

[Text] An analysis of the work of the NPO and independent scientific research institutes and design bureaus in machine building shows that they have not yet become that leading force which is capable of solving problems of scientific and technical progress. At the present time in the system for controlling the activity of branch scientific research institutes (design bureaus) and plants and their interaction in the creation of new technical equipment one can single out three structural models:

The first model: the scientific research institutes (design bureaus) conduct scientific research and develop technical plans for new items, which are submitted to production associations (PO's) or machine building plants for the creation of the blueprints, the manufacture of experimental models and the assimilation of series production. The work experience of scientific research institutes (design bureaus) and plants according to this model shows that as a result, as rule, considerable interruptions in time appear between the transfer of the technical plans to the plants and the assimilation of the new items, and the scientific research institutes and design bureaus are no longer responsible for the level of the technical equipment that is created. Moreover, in many cases the technical plans drawn up by the scientific research institutes and design bureaus never end up in production at all.

The second model: scientific production associations as parts of scientific research institutes, design bureaus and experimental-testing plants, which are to be responsible for the development of the latest technical equipment from research to the stage of the development of the experimental model. The task of series assimilation and supply to the national economy is assigned to machine-building plants. But here again there arises a time lag between the stages of the process of creation of new technical equipment. Moreover, in this structure the scientific production association is relieved of responsibility for providing the national economy with the latest items.

The third model: the creation of NPO's which join together scientific research institutes, design bureaus and experimental and series plants which produce products of a certain list.

The creation and introduction of the latest technical equipment into the branches of the national economy is a complicated, multistage process which can be carried out more successfully with time periods reduced to a minimum only under the condition that the work on it is continuous. Continuity can be achieved only under the conditions of this model of NPO. This is corroborated by the experience in the creation and functioning of the Kriogermash NPO.

In essence, the Kriogermash NPO was created twice. It was organized for the first time in 1968 on the basis of the All-Union Scientific Research Institute of Oxygen Machine Building (VNIImash) and the plant. All services of the institute and plant in this NPO remained independent. A certain influence was exerted by the territorial separation: some of the divisions of the VNIImash were located in Moscow although the basic scientific forces had already been concentrated in Balashikha. For the institute which became the head subdivision of the association they constructed a good building here and an experimental design base.

Up until 1972 I was the general director of the NPO and the director of the scientific research institute, and not far away from the institute was a plant which was formally under my jurisdiction (the director of the plant was appointed first deputy general director of the association for production) but in fact he worked independently, had his own account in the Gosbank, and was an independently involved in outside communications with the branch and party and Soviet agencies. The technical policy of the institute and plant were not coordinated. Of course it was much more advantageous for the plant to produce series products than to make new technical equipment. As a result, many of the plans which were developed by the institute lay on the shelf. Naturally, in these conditions it is impossible to provide for continuous creation of new technical equipment.

Only since 1972, when the NPO was reformed at a higher organizational level, did the effectiveness of its activity increase. In that year on the basis of the former association two scientific production associations were formed: one in Balashikha and the other in Moscow where, on the basis of the Moscow divisions of the former VNIImash they created the Scientific Research Institute of Helium Equipment which, in conjunction with a small Moscow experimental plant for helium machine building, formed the NPO for helium machine building.

The restructuring of the management of the Kriogermash NPO was based on a comprehensive target approach to the organization of management of science and production. Without this, in our opinion, it would have been unthinkable to have a unified scientific production association. All of the basic functions of management were centralized at the level of the NPO—unified divisions were created for the plant and the institute: technical and economic planning, organization of labor and wages, bookkeeping, the financial division, material and technical supply, cooperation, staffing and others.

The institute has practically no administrative and management personnel with the exception of the institute's director and his deputies. The structural units—the institute and two plants (in 1976 another newly constructed experimental plant for refrigeration machine building was included as part of the NPO)—lack an illegal independence. In keeping with this new structure of management there was a restructuring of the party, trade union and Komsomol organizations, which are now also unified.

One-man management and centralization of the management functions were important prerequisites for carrying out all-encompassing planning and management of all stages of the development, production and introduction of new technical equipment. The thematic plan for scientific research and experimental design work, the plan for production and the plan for technical preparation of production are now intercoordinated and a unified plan is drawn up for the technical-economic and social development of the collective.

The organizational structure that was adopted contributes to realization of the principle of all-around responsibility for the creation of new technical equipment. In the scientific research institute we created nine specialized divisions for the various kinds of technical equipment that are being developed and the various areas of activity. We introduce the status of chiefs of divisions, head design divisions and head designers for various items. The head division is responsible from the beginning to the end for the manufacture of the equipment that has been developed and it supervises the installation with the client, the startup and adjustment work and the subsequent operation.

The work experience of the leading Soviet NPO's, production associations and foreign firms shows that in order to reduce the time periods for the creation and introduction of new technical equipment it is necessary to provide for continuity of this process.

In order to provide for continuity of the process of creating new technical equipment, scientific workers employed in applied research, designers, technologists and production workers must work according to a unified all-encompassing plan-schedule and have close scientific-technical and organizational ties among themselves.

What has been done to realize this approach? To the usual vertical ties that go from the management of the NPO to all the services and production subdivisions we have added horizontal ones. It seemed to us that coordination and all-encompassing cooperation in the work on new items should be the responsibility of the developers—the head design divisions and the leader designers for the different kinds of technical equipment. The leading designer has been given the necessary authority so that he does not need to go to the managers of the subdivisions each time regarding problems in creating the item. He has the right to convene operational groups of all specialists engaged in the all-encompassing process of realizing the development, to make decisions and to act on the basis of these until they are confirmed at a higher level of management of the NPO. While previously a new item like a relay baton was handed from one stage to another, now, on the basis of the

all-encompassing plan-schedule, the stages are combined and fewer interruptions arise.

Thus the linear-functional structure has been augmented with a functional-matrix structure and because of this there is efficient coordination, control and regulation of the work on the concrete plans in all stages of the creation of items of new technical equipment.

The unity of the organizational structure and the all-encompassing planning and management were the basis for the creation of the integrated systems for management of the Kriogermash NPO (ISU NPO), which included as subsystems:

the comprehensive system for controlling the effectiveness of production (KS UEP);

the comprehensive system for product quality control (KS UKP);

the comprehensive system for control of scientific and technical development (KS UNTR);

the integrated automated system of management (IASU).

Each of these subsystems serves as an instrument for control and improvement of the economic mechanism in particular areas of the activity at the NPO and the unity is achieved by means of the fundamental standards at the enterprise (STP).

The comprehensive system for controlling the effectiveness of production regulates all production, labor and social aspects of the life of the collective—the insurance of stable and rhythmic work of the subdivisions when fulfilling monthly, quarterly, annual and five-year plans, and also socialist commitments and counterplans. The central unit of the subsystem is the plan for technical-economic and social development of the association. Because of this it has become possible to have all-encompassing planning of scientific and technical developments and the production of new technical equipment.

The KS UKP is a systematized complex of measures and documents which are directed toward increasing the reliability of the items of refrigeration equipment, toward providing for an increase in the volume of the output of items in the highest quality category, and toward increasing their ability to compete on the world market.

The basic organizing document for the KS UKP is the comprehensive plan for improving the quality of the items. It contains sections: prognostication, planning and coordination of work for raising the technical level and improving the quality of products; development and implementation of programs for ensuring the quality of newly created items; certification of product quality for the highest category; verification of the effect of the KS UKP, training of personnel, development and revision of normative documents for the KS UKP.

The KS UNTR include the complex of organizational rules and methods directed toward predicting the development of new technical equipment and technology in refrigeration machine building, raising the level of control of scientific research, design and technological work, and substantiating and developing the experimental displaced end base of the NPO.

The integrated automated system of management (IAS U) integrates both tasks for automated management of scientific and production activity and the automation of scientific research and planning of designs and technologies. It includes:

an automated system for control of scientific and production activity of the NPO (ASUP NPO Kriogemash);

a system for automated design of items of refrigeration equipment (SAPR-Tekhnika);

a system for automated planning of technological documentation (SAPR-Tekhnologiya);

an automated system for scientific experiments and stand testing (AS NESI).

Because of the functioning of the ASUP we have succeeded in significantly raising the level of operational planning and management. We have transferred to computers the development of the monthly detailed plan-schedule taking into account the load on workers in the various shops and occupations, control over the fulfillment of the production program, calculation of the number of workers in the cross-section of occupations among the various subdivisions of the NPO, the calculation of the production cost, calculations for material and financial resources, wages and so forth.

The complex SAPR-Tekhnika helps us to solve problems of mathematical modeling of refrigeration installations and heat and mass exchange processes, technological calculations of circuits and apparatus, and selecting the most effective conditions for the operation of these items, determining optimal parameters for refrigeration systems and pipelines, and so forth).

The SAPR-Tekhnologiya was developed and introduced for purposes of machine designing of technological processes for boiler-welding and mechanical production. We have managed to change over to machine design the cutting of sheet material with putting cutting cards into production, the number of technological processes in boiler-welding production that take up a large proportion in refrigeration machine building, and the development of fittings for manufacturing parts and assembly units and also programs for machine tools with numerical program control.

The automated system of scientific experiments and stand testing provides us with improved quality of research and experiments by means of automation and computer checking of planning decisions for thermal hydrodynamic and heat exchange processes in refrigeration equipment, mechanical and endurance characteristics, processing of the results of stand testing, and so forth.

The work for improving the system of control has produced certain results. In the NPO during the period since 1972 the volume of products sold has more than doubled, reaching 126 million rubles, which is 58 million rubles more than the planned capacity of plants, and the volume of scientific research and planning-design work has almost doubled.

From 65 to 80 percent of the products that are produced are new ones. For the majority of kinds of refrigeration equipment we are at the world level and for certain kinds we surpass it. It is remarkable that our country does not have to purchase this kind of equipment abroad, that is, the refrigeration equipment fully satisfies the needs of the national economy. With respect to certain kinds of it the USSR is a large exporter, including to developed countries.

During 1976-1985 the association created 19 new types of air separation installations, 14 refrigeration-vacuum installations, 46 new types of refrigeration storage facilities and gasifiers, 11 types of nitrogen and helium systems for superconductor energy installations, and it created a principally new type of equipment for enriching gas mixtures—membrane gas separator installations (MGU) which have been used in fishing, medicine, storage of agricultural products and so forth.

In order to create new refrigeration equipment the association has completed a cycle of research on intensification of the processes of heat and mass exchange. On the basis of this research we have developed a design for a rectification column with a proportional load per unit of volume which is approximately twice as much as in the designs that are known in domestic and foreign practice. This has provided for the creation of the RT-70, the largest air separation installation in the world, with the productivity of 70,000 cubic meters per hour of oxygen for the blast furnaces of the Krivoy Rog Metallurgical Plant, the largest in the world. The United States and the FRG have received patents for the design of the column and the license has been sold to the Air Products Firm (United States) and Linde (FRG).

Understandably, we have not managed to do everything we have intended to do and there are many unrealized ideas, and certain omissions are also obvious. The internal resources for improving management are far from exhausted. We are well aware of this. But the NPO is working not just for itself, but is in a system of certain social-production and economic ties with the branch, supply enterprises, client enterprises of the products, planning agencies and territorial management agencies. The imperfection of the interaction of the systems for planning, evaluation of the results, wages and the organization of material and technical supply have a negative effect on the work of the NPO.

ENO has repeatedly addressed problems of the NPO, particularly in No 1 for 1985, where an entire selection of materials was devoted to increasing the effectiveness of their work. A number of questions which were raised have not been resolved, but the fulfillment of the tasks set at the 27th CPSU Congress in the June (1985) conference in the CPSU Central Committee concerning acceleration of scientific and technical progress depend on them, and therefore I wish to discuss them again.

The existing systems for economic planning and evaluation of the results of the scientific production activity of the NPO, wages and bonuses not only do not contribute to the integration of science and production but, on the contrary, separate the scientific-technical and production subdivisions with significant economic barriers. Scientific research institutes are now included in the sphere of "science and scientific service" while enterprises are included in the sphere of "production." The activity of scientific research institutes is planned through the State Committee for Science and Technology, and that of machine building plants—through the USSR Gosplan. Their problems are handled by various deputy chairmen of the USSR Council of Ministers. In the ministries the scientific research institutes are controlled through technical administrations for the plants are controlled through planning-economic administrations, and they are supervised by different deputy ministers.

For the first time scientific research institutes and enterprises are found together as parts of all-union industrial associations (VPO's). But independent institutes and design bureaus are not directly responsible either for the completeness of the provision of equipment for the national economy or for its technical level. At the present time institutes are responsible for the fulfillment of thematic plans which they form for themselves. In the NPO the responsibility of the subdivisions for the level of the technical equipment that is created is higher. But for the systems of economic planning, wages and bonuses they are completely separated from the production workers. The planning of their activity and their payment in this respect differs little from independent scientific research institutes and design bureaus.

Up to this point we are not clear about what distinguishes the NPO from the PO. It is presumed that the PO and the plants produce mainly series products while the NPO produces mainly new technical equipment. Yet in life these boundaries are erased and the PO's, in which entire institutes frequently work, produce new technical equipment while NPO's which have weak scientific collectives manufacture outdated products.

The economic incentive funds in the NPO's are established, as before, individually for scientific research institutes and individually for plants. They have different fund-forming indicators.

The decree of the CPSU Central Committee and the USSR Council of Ministers of 12 June 1979 concerning improvement of the economic mechanism envisions the creation of an increased economic incentive fund for associations and enterprises that significantly increase the output of new, highly effective products for production and technical purposes and new consumer goods. But in fact the assimilation of new technical equipment reduces the economic incentive funds.

In order to increase the integration of science and production and accelerate scientific and technical progress, in our opinion, it is necessary to introduce a better structure of administration into machine building. To do this it would be expedient to change over completely to a two-unit structure of management, abolishing the all-union industrial associations (VPO's) and

transforming them into all-union scientific production associations according to the types of equipment that are developed and produced (for example, the all-union scientific production association for refrigeration machine building, the all-union scientific production association for autogenic machine building, and so forth).

The VNPO should be headed by the general designer who is appointed from among the imminent scientists (specialists) and organizers of science and production. The VNPO should be responsible both for the quantity and for the quality of the equipment it delivers to the national economy, for which it should include all scientific research, design and technological institutes and machine-building plants that produce products with the corresponding profile. The functions performed by the VPO at the present time should be transferred to the functional administrations of the ministry (PEU, production, labor, wages and social problems, and so forth).

All of the branch scientific research and design technological institutes should be included in the sphere of production (scientific-production) activity, which includes all machine-building enterprises. Then all that would be left in the sphere of "science and scientific service" would be academic institutes of union and republic academies, NIS of higher educational institutions which are called upon to conduct main basically fundamental research.

The control, planning and evaluation of the results of the scientific and production activity of the VNPO should be provided by the ministries through the USSR Gosplan, and it would be expedient for the State Committee for Science and Technology to retain methodological leadership and control over the fulfillment of scientific and technical programs, the scientific and technical level of the equipment that is produced, invention and efficiency work and other functions that are not directly related to the management of the scientific and production activity of the VNPO.

For the VNPO and the organizations and enterprises included in it it is necessary to develop unified systems of economic planning and evaluation of the results of scientific production activity, systems of wages and bonuses for all categories of workers--scientific associates, designers, technologists and production workers--and new methods of price setting.

As the basic indicators of the scientific production activity of the VPO which are established by higher agencies, from our point of view, one could recommend the following:

a) the production of the basic kinds of products in physical terms, including items of new technical equipment and products for export. Moreover, the development of annual and five-year plans for machine-building ministries (and enterprises) should be done through the list of equipment that is being created and consumed. Each branch of industry that consumes machine-building equipment should have a clear-cut plan for reconstruction and capital construction of each of its enterprises and provide orders for equipment that are backed up with financing. On the basis of these orders the machine-building ministries and enterprises will draw up annual and five-year plans

for products lists. These are the basis for determining the growth rates of the volumes of output of products and labor productivity.

b) the fulfillment of commitments for deliveries and concluded agreements;

c) the planning of the volume of work in value measurement (gross, commodity, sold output) and indicators derived from these (profit, labor productivity, output-capital ratio) should be done not from the level that has been achieved but on the basis of a calculation from the planned products list and the level of prices established for it. Planning and accounting for these are done as a running total from the beginning of the year (and not month by month).

d) In order to accelerate the creation and introduction of new technical equipment it is necessary to improve the existing system for evaluating the quality of the products that have been produced. At the present time the evaluation of product quality is done according to the proportion in the overall volume of production of items that are certified for the state Emblem of Quality. This policy for evaluation is an impeding factor in the acceleration of the creation and introduction of new technical equipment.

As we know, the Emblem of Quality is conferred on products that are already assimilated and being produced stably, for which there are permanent technical specifications. Therefore it cannot be received in the stage of the production of new technical equipment since its testing is done after the installation and startup of the equipment on the premises of the client and not in the process of production. Yet practically all new equipment must be created at the level of the best world models and in their parameters they must correspond to the highest quality category.

Therefore the quality of the product should be evaluated according to the indicator of the proportion of products of the highest quality category defined as the ratio between the sum of the annual volume of new items of the highest quality category and the volume of series products certified for the State Emblem of Quality as compared to the overall volume of production.

Below is a table that characterizes the dynamics of the indicator of the quality of products produced by the Kriogermash NPO during 1976-1984.

<u>Year</u>	<u>Proportion of Products With the Emblem of Quality in the Overall Volume of Production</u>	<u>Proportion of Products of the Highest Category (New Technical Equipment Plus State Emblem of Quality in Overall Volume of Production</u>
1976	12.8	40.5
1977	38.6	53.0
1978	22.9	64.5
1979	23.2	66.1
1980	11.5	67.2
1981	11.6	73.7
1982	7.7	75.1
1983	9.2	71.7
1984	12.0	77.1

From the table one can see that with the proportion of products with the State Emblem of Quality, which ranges from 7.7 to 38.6, the proportion of products in the highest quality category has been significantly increased, from 40.5 percent in 1976 to 77.7 percent in 1984. The proposed policy for evaluating the quality of equipment will stimulate both certification for the State Emblem of Quality for series-produced products and the development and assimilation of new technical equipment.

It is necessary to refine the existing policy of setting prices for new (modernized) kinds of products. According to the existing provisions wholesale prices for new technical equipment are established on the basis of the cost of the development of technical documentation and expenditures on the production and assimilation of the item and the normative of profitability established by the USSR State Committee for Prices according to the groups of analogous series manufactured products. This policy for price setting encourages increasing expenditures.

We have the following incident. The Novolipetsk Metallurgical Plant ordered oxygen and nitrogen installations. We were able to carry out the task by delivering five installations and receiving 4 million rubles, but it was possible to create one comprehensive air separation installation which would have simultaneously produced both oxygen and nitrogen. But the price of this one installation reached the level of 2.5 million rubles, that is, we lost a million and a half rubles. Of course, sooner or later they would have figured this out "up above" and would have forced us to make this installation. But we did not decide to wait for that and manufactured the installation immediately, acting for the sake of the moral aspect of the matter and the prestige of the NPO, forgoing certain economic advantages. But objectively this policy for price setting encourages increasing material expenditures and using costly batching items so that as a result of this it will be possible to increase the price of the items and provide for fulfillment of the plan with respect to the volume of production, product sales and profit.

The USSR State Committee for Prices should develop a unified set of methods for price setting for any items of new technical equipment. It is necessary to proceed from the planned profitability of the items set for the enterprise and the economic effect of the new item in the country's national economy. For products that are "experimental models (batches) of items sold to the consumer" for which the economic effectiveness cannot be determined, it is necessary to develop a system of incentives analogous to the one adopted for export deliveries, that is, to include in the price deductions into the economic incentive funds in an amount of up to 4 percent of the overall cost of the item.

The problem of increasing the effectiveness of new technical equipment and reducing the time periods for assimilation is inseparably linked to the need to improve the existing system of wages and incentives for designers and technologists and increasing the prestige of their labor.

Up until the present time there have been two systems of wages for workers in effect in the NPO: for the institute and for the plants, and there have been

three systems of material incentives (for the plants, for the institute and for the management of the association). The established standard provisions concerning unified bonuses for workers of the NPO have not been fulfilled by the branches. Various systems of wages and incentives separate the interests of the workers of the institute and those of the plants.

Beginning on 1 January 1986 we introduced a unified schedule for wages for workers in the NPO. In this connection, from our standpoint, the USSR State Committee for Labor and Social Problems must develop a unified system of bonuses for workers of institutes and plants and also a unified system of fund formation for the NPO as a whole. The existing lower level of payment for designers and technologists as compared to scientific workers narrows the possibility of staffing design and technological subdivisions with skilled personnel.

Each year there is a smaller number of people competing for admission to VUZes that train specialists in this profession. The most prepared graduates try to get "set up" in scientific research institutes and laboratories where there is a more favorable opportunity to concentrate on research work with the prospect of defending a dissertation and obtaining a scientific degree and an essential increment to their wages.

In order to strengthen these units, to create conditions for staffing design and technological subdivisions with highly skilled personnel, and to increase the prestige of their labor, after the June conference in 1985 a number of measures were taken. They approved the provisions concerning the title of honor "Honored Designer (Technologist) of the USSR" which is awarded to especially excellent workers in this profession. A decree was adopted concerning increasing the wages of designers, technologists and scientific workers. In our opinion, it is necessary to develop special provisions which determine the policy for conferring scientific degrees and titles for these categories of workers without writing dissertations but for the totality of especially important developments that have been introduced into the national economy. It is known that it is the active developers that have the least time for defending scientific dissertations. The potential of the scientific and technical activity of the leading designers is very great. In their developments they embody solutions which are of great scientific significance. But the payment for their labor is less than that of a rank-and-file associate of a scientific research institute with a scientific degree. Therefore it is important to correctly solve the problem of determining their scientific potential without their defending dissertations.

It seems to me that the realization of the proposed complex of measures will contribute to increasing the return from NPO's.

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NEW TECHNOLOGIES DEVELOPED FOR REFRIGERATIONS SYSTEMS

Novosibirsk *Ekonomika i Organizatsiya Promyshlennogo Proizvodstva* (EKO) in Russian No 4, Apr 86 pp 58-66

[Article by V. I. Sukhov, candidate of technical sciences, deputy director for science and technology of the Kriogenmash NPO, and Yu. M. Broshko, chief of the division for planning, management and introduction of new refrigeration equipment: "Cryogenics and New Technological Systems"]

[Text] Cryogenic equipment ("cryogenic" is from the Greek word "krios"—cold or frost) deals with problems of obtaining, maintaining, and utilizing temperatures lower than -150° and is one of the young, rapidly growing and promising branches of technology. Its active industrial application began both in our country and abroad during the 1930's and was linked primarily to the utilization of liquid and gaseous cryogenic products—oxygen, nitrogen, argon and hydrogen—in metallurgy, chemistry and machine building.

But during the past 2 decades, in addition to its application for traditional purposes, there has been a rapidly growing demand for refrigeration equipment for new branches of science and technology. High-energy physics, energy engineering, instrument building, biology, medicine and agriculture have demanded the development on an industrial scale of technologies for obtaining cryogenic cold right down to the temperature of liquefaction of helium— -260°C —that is, right down to a temperature close to absolute zero. Without this it has turned out to be impossible to create many new technological systems.

Our NPO is developing the following five areas of cryogenic equipment.

1. Air separation installations (VRU). The atmospheric air is compressed and compressed at cryogenic temperatures, and then it is separated into its constituent parts: oxygen, nitrogen, argon, krypton, a neon-helium mixture, and so forth. The rectification (separation) is based on the difference in the boiling temperatures of the gases that are included in the composition of the air.

The air separation installations, although they are among the traditional areas in cryogenic technology, are exerting an immense influence on the acceleration of technical progress in a number of branches. Thus the use of

oxygen when smelting steel led to a radical improvement of steel-smelting processes and a significant change in the structure of steel-smelting production. During the past decade the consumption of oxygen in this process has increased almost 1.6-fold. With the changeover from the Marten to the oxygen converter method of obtaining steel labor productivity increases 2-3-fold.

In blast furnace production the utilization of oxygen blasts significantly intensifies the process of smelting iron and makes it possible at the same time to obtain 2-2.5 times more metal per square meter of area in a blast furnace. There are no analogues in the world of the air separation installations created by our NPO for the Krivoy Rog blast furnaces with a capacity of 70,000 cubic meters of gaseous oxygen per hour. They are at the very highest technical level with respect to processes of rectification and heat and mass exchange—the basic technological processes of the air separation installation—and also with respect to design.

The introduction of cryogenic equipment into ferrous metallurgy produces a very solid savings: the investment of a million rubles in the creation and introduction of air separation installations save about 8 million rubles a year.

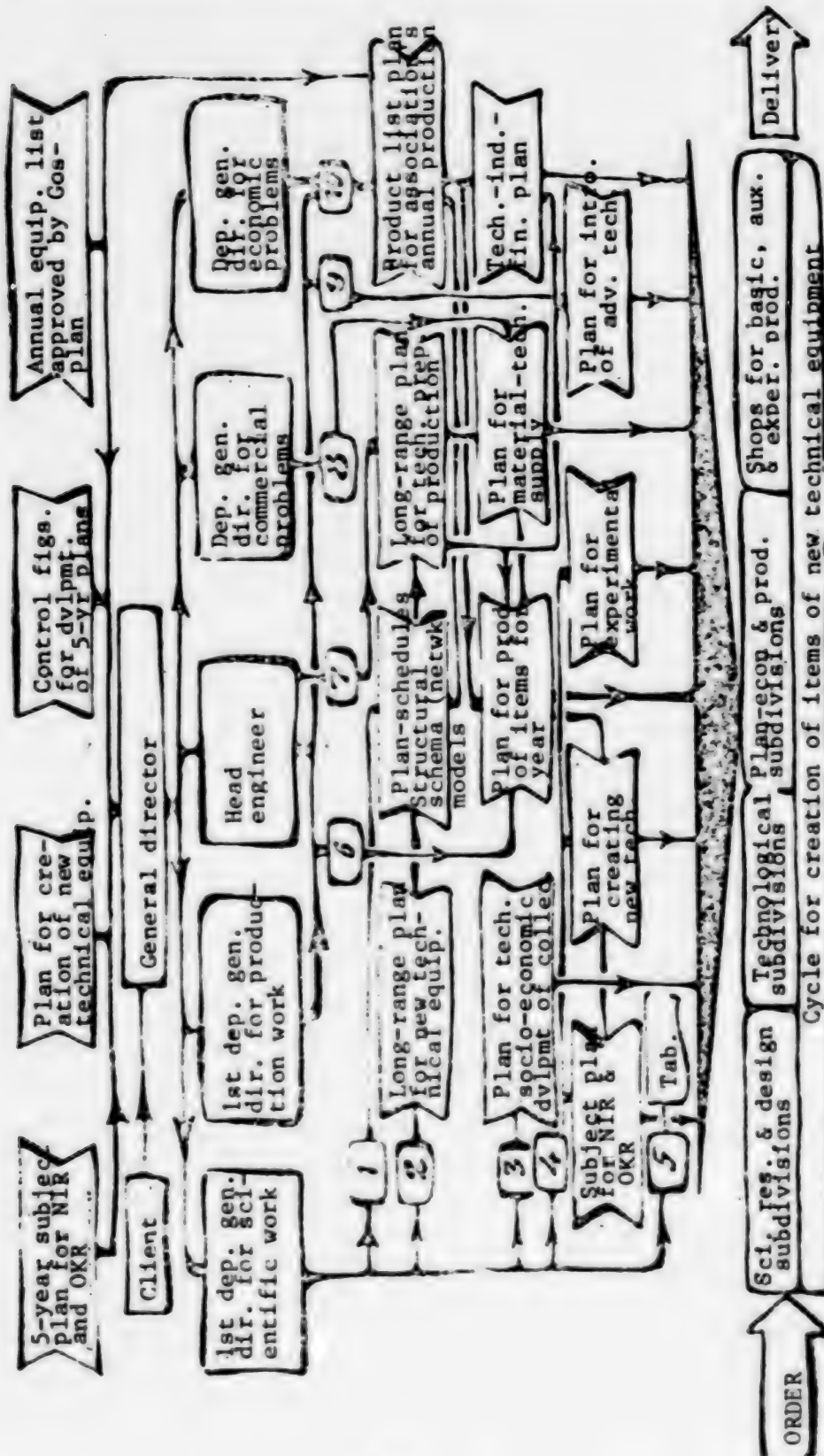
In nonferrous metallurgy and chemistry, along with the utilization of oxygen in certain technological processes for obtaining lead, zinc, copper and nickel and in the production of ammonium, acetylene, methyl alcohol and concentrated nitric acid, work is being done to introduce it into future technologies for the production of sulfuric acid, for obtaining protein and vitamin concentrates and other things.

The chemical industry and the mineral fertilizers industry are also large consumers of nitrogen. They account for more than 60 percent of the overall balance of consumption. Nitrogen has been used extensively as a technological component in the production of ammonium, urea, caprolactam, ethylene, propylene, polychlorovinyl, and artificial and synthetic fibers. In the petrochemical industry nitrogen is used in processes of gasification of coal and petroleum. The utilization of nitrogen obtained from rectification of air in air separation installations produces an immense savings on natural nitrogen raw material.

2. The system of storage and gasification of cryogenic products. The capabilities of modern cryogenic equipment make it possible to economically compress large quantities of oxygen, nitrogen, argon, hydrogen, methane and others in order to store them and transport them in liquid form. The proportional volume of compressed gases is one-six hundredth to one-eight hundredth the volume of the same gas under normal conditions. Herein lies the economic advantage of storing and transporting gases in liquid form.

The growing scale of the application of cryogenic products has made it necessary to solve problems of transporting them in pipelines, and therefore the NPO has conducted research, design and technological work making it possible to assimilate the production of cryogenic pipelines. They have a great future.

All-Encompassing Planning of New Technical Equipment



3. The provision of cryogenic systems for superconductor technical devices. The application of superconductor devices opens up broad new possibilities for significantly improving the characteristics of electrical equipment, energy and other equipment. Superconductivity is one of the remarkable discoveries of our century. It appears only at temperatures of $-250-269^{\circ}\text{C}$, and then the resistance to electric current is reduced to zero.

Intensive work is being done on models of superconductor electrical machines with cryogenic cooling systems—electric engines and generators with superconductor windings. The unit capacities of such electrical machines will be much higher than the capacities of the existing ones. EKO has written about the work on these machines in the Elektrosila Association.¹

The utilization of superconductivity makes it possible in principle to replace the airlines of electric transmissions with superconductor cables in which there are practically no losses of electric current. All this taken together opens up the possibility of solving in the future one of the global problems of mankind—the fuel and energy problem.

In a number of cases the phenomenon of superconductivity provides the only possibility of solving the technical problem. The creation of strong magnetic fields by the usual method requires immense expenditures of electric energy. It is another matter when one uses superconductor magnetic systems in which the winding of the magnets is cooled by liquid or deep-cooled gaseous helium. In these cases the sizes of the magnetic systems are reduced and expenditures of energy are reduced by dozens of times. Specialists of our NPO have created many unique systems for cryogenic provision for superconductor installations.

4. Membrane gas separation installations. The Institute of Petrochemical Synthesis of the USSR Academy of Sciences in conjunction with other participants created synthetic membrane films which have a high selective capacity to allow one or another gas to pass through. The membrane installations are effective in fishing for enriching the bodies of water with nitrogen. The small fish grow twice as fast and the mothers do not die. In vegetable storage facilities because of these installations it is possible to create a nitrogen environment which wards off processes of rotting.

Membrane gas separation installations, strictly speaking, are not included among cryogenic equipment, but most of them will operate in conjunction with cryogenic equipment. These same vegetable storage facilities can be created with inert gas (a nitrogen environment). Such storage facilities have been widely used abroad. So far in our trade we are unwilling to use membrane installations. Nonetheless on one of the fruit and vegetable sovkhoses of Kazakhstan they managed to use them to create a storage facility with three chambers where they used installations which take the nitrogen from the air, concentrate it and put it into the chambers for storing fruits. The problem now is that the membrane films are still too expensive.

5. Cryogenic vacuum installations. Cryogenic equipment is extensively used for the creation of cryothermal vacuum chambers and imitators of cosmic space. Understandably, any experiment in space involves large expenditures. Therefore it is very important for the research on the designs and the testing

of their reliability to be conducted on land under conditions that are close to those in space. Because of its complexity and its newness cryogenic equipment is extremely science-intensive. Expenditures on science comprise an average of about 50 percent of the cost of the items. The proportion of new technical equipment in the overall volume of work of the NPO amounts to an average of 65-80 percent. These peculiarities have predetermined the organization of work on new technical equipment on the NPO.

In order to work in all of the areas entrusted to us and at the same time promptly satisfy the demands of the clients, the following organizational solutions are applied. The institute has created design and scientific research divisions which specialize in the various kinds of technical equipment being developed—air separation installations; cryogenic systems that provide for superconductivity; cryovacuum systems, and so forth. Moreover, we have organized five divisions that provide for improvement of control of science and production: automation of work; scientific organization of labor and management; research on processes and apparatus of cryogenic equipment; research on technological processes; planning, control and introduction of new cryogenic equipment.

In the design divisions all the areas of work are assigned to head design sections (3-5 in each division) which are responsible for all processes from the development and production of the item to its introduction by the client. The leading designer is thus the leader of the target program and by an order for the NPO he is given the authority to solve all problems independently, throughout the entire chain from the generation of the idea to the client's assimilation of the technical equipment. Therefore in each head design section are concentrated design bureaus, research laboratories that conduct research in this area, and startup and adjustment subdivisions that perform for the client special jobs which are beyond the capabilities of the main section of the installation chief of the NPO.

Promising research is being done by divisions for investigating processes and apparatus of cryogenic equipment and technological processes. For example, the prospects for the utilization of natural gas as fuel for automobiles, steam engines and other means of transportation were investigated by the scientific research division for processes of cryogenic equipment. As soon as they receive the results that promised the possibility of conducting development the subject was included in the plan for the work of the design section. The division for research on technological processes of machines is also working for the future. In its daily work on technological service for production it includes the services of the head technologist, the sections for mechanization and automation (OMA), the fittings section, and the sections of the head welder and head metallurgist.

Of the 2,500 workers of the institute there are 1100-1200 designers, 800-1000 researchers, and 300 technologists. But it should be noted that of the overall number of people employed in the institute 200-300 are working for the subbranch. Our institute is the head institute in the subbranch for long-range planning and development of the production of cryogenic equipment, methodology, price setting and standardization.

The NPO has developed a system of all-encompassing planning of the creation of new technical equipment which makes it possible to considerably reduce the time periods of work. The idea of the existing mechanism of planning consists in not arranging all work sequentially, in stages, but organizing it in parallel, combining the stages.

A structural diagram is drawn up for the item and it is broken down into its constituent parts. An order is created for each part and it is possible to work on it independently, regardless of the other orders. At the same time a consolidated all-encompassing plan-schedule is drawn up for the item, which makes it possible to exercise control and to coordinate the work as a whole. and, finally, for the most complicated items where it is difficult to calculate the critical paths of work without a computer, network schedules are made.

An important element of the system of all-encompassing planning is the utilization of one and the same planning unit in all stages of the creation of the new item—the "order" which is composed of a separate part of the item having to do with design and technology. Air separation installations, for example, have from 19 to 23 dispatch complexes—the turbodetonator, the rectification block and so forth. They can be assembled and packed individually. The fact that the structural schema makes it possible to separate constituent parts of the cryogenic complex and work on "orders" autonomously significantly reduces the time periods for production.

In order to provide for a high technical level and high quality of such complicated technical equipment as cryogenic equipment it is necessary to constantly engage in increasing the scientific and technical potential of the NPO. We have singled out the following constituent parts of it:

qualifications of personnel;

scientific-technical and experimental base;

information base.

What methods for increasing potential are used in the NPO? Let us consider the main ones.

In order to raise the level of qualifications of personnel we have created a correspondence tekhnikum and machine building institute with a department for cryogenic equipment, and a training laboratory. A graduate school has been organized in the department. The scholarly council of the association has the right to confer the title of candidate of technical sciences in the specialty "Cryogenic Technical Equipment." Thus the most skilled developers and researchers have the opportunity to perform the work for a scholarly degree without leaving production.

The results of the innovations are determined largely by the degree of readiness for them. Sometimes the most progressive innovation can be ineffective if the collective has not been prepared to receive it. Many automated systems for control of production, technology and planning have

failed. We do not let an innovation take off of its own accord. At the time of the realization of technical and management innovations we practice various kinds of technical and economic training. The students are all specialists from the brigade leaders and foremen to the management workers of the NPO. At one seminar one person can be a listener while at another he can conduct the classes, since a large part of our classes are conducted by the association's specialists themselves.

Previously the NPO was oriented more toward speakers and lecturers from the outside. On the theoretical plane they provided useful information but the knowledge received from them did not help much in the realization of innovations. Therefore it was decided that if some management development was being realized, the seminar devoted to its study and the classes should be conducted by the specialists who developed it. This method was used for training in the system of automated planning of technology and there is now a school for SAPR for technical equipment.

A good deal is being done to develop the experimental base for natural and imitation modeling. New stands are being created which have provided the possibility of testing various kinds of complicated equipment on the spot, before it is sent to the client. During the past 10 years the level of supply of the scientific and technical base with computer equipment in the association has increased 2.5-fold.

Information and patent work is arranged on the basis of annual comprehensive plans. The bank of inventions of the NPO contains 800 authors' certificates. An average of 100 applications are filled out each year. Each kind of cryogenic equipment that is manufactured contains from 5 to 20 inventions. All of the equipment developed by the Kriogermash NPO has clear patents in the leading countries of the world.

Unification and standardization constitute a significant reserve for accelerating the technological and design preparation of production. They are based on the following organizational diagram: classification of the list of items—unification of the designs—typization of the technological processes—specialization of the shops and sections—mechanization and automation of production. The creation of a classification system for items, assembly units and parts has made it possible to sharply raise the level of work for design and technological preparation of production. Thus, for example, the coefficient of applicability for the main kinds of items has increased from 60 percent to 80–90 percent, and the overall volume of design documentation in the archive has been reduced, because of this, from 250,000 to 120,000. More than 100 unified albums with standard solutions for assembly units and parts have been developed.

The organizational solutions for controlling developments and the assimilation of new technical equipment and increasing the scientific and production potential have made it possible to considerably reduce the time periods for creating new products. For air separation installations they have decreased from 66 to 36 months, cryogenic storage facilities—from 15 to 9 months, and so forth. These time periods make it possible to maintain the rate of renewal of cryogenic equipment which exists in the world. But at the same time there

are significant reserves for acceleration. The NPO is working on utilizing them.

FOOTNOTE

1. Aroshidze, Yu. V., "The Staff of Technical Progress," ENO, No 7, 1982.

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PRODUCTION CHANGES RADICALLY WITH TIME

Novosibirsk *Ekonomika i Organizatsiya Promyshlennogo Proizvodstva* (ENO) in Russian No 4, Apr 86 pp 66-75

[Article by L. Khochunskaya: "The Manager and the Rhythms of the Time"]

[Text] Viktor Petrovich Belyakov has been in charge of the Kriogermash NPO for 13 years. This is how long the association itself has been in existence. One of the workers in the ministry said about Belyakov: "He was born a Kriogermash worker!" No one will contradict this: Belyakov's authority in cryogenics is indisputable. But those who began to work with him in Balashikha, who believed in him and in whom he believed, know how long and tortuous this "birth" has been.

A graduate of the Aviation Institute, V. P. Belyakov never thought that at some time he would have to "drop from the sky onto earth." But life is generous with the unexpected. When V. P. Belyakov took charge of the Kriogermash NPO his assets included a higher technical education, a doctoral dissertation (on engines) and 4 years of management of a scientific institute. Everything comprised his "liabilities." Four years of study of problems of cryogenic—a ridiculously small amount of time to fully master the subject; an inadequate knowledge of the specific nature of industrial production; the newness of the very form and specific nature of the NPO on the scale of the country and everything that follows from that. Here was something to engage his mind.

And Viktor Petrovich's mind was engaged. But it was necessary to get things done.

Some specialists openly expressed dissatisfaction and a lack of confidence: controlling production was not the same thing as writing a dissertation. But Belyakov himself understood this better than others did. Today the director will solve any problem along with dozens of other people involved in the same thinking, students and assistants. At that time the situation was different: the collective was just being born.

Those who have recently come to the NPO do not think about the fact that the system of working on new technical equipment according to all-encompassing plan-schedules with parallel and sequential-parallel realization of individual

stages which is now in effect here required many months of grueling research from V. P. Belyakov.

"But how else could it be?" asks one young cryogenic engineer, a recent VUZ graduate. "The development of technical documentation and the preparation of production should proceed in parallel. Otherwise a century would pass from the time of the creation of the experimental model until series production. This is—elementary...."

Yet this solution was found only because at the NPO they had centralized all functions of management of the institute and plant at the level of the association and had introduced a system of all-encompassing planning. Research on acceleration is being conducted with more or less success in other scientific production associations as well. But it was precisely in Balashikha that this logical and apparently simple solution originated—"cutting" the item into parts, opening its own "order" for each of them and working on them in parallel. People who come here from other enterprises are frequently surprised: how is it that this was not thought of before now?

This system not only helps to accelerate the process of the creation of new technical equipment, but also changed people's psychology. Now the collective of Kriogermash lives not only with the concerns of today—just to fulfill the plan—but also thinks about what it will be doing tomorrow. Here everyone does his own work for which he is completely responsible. The designer, for example, understands: it is necessary to be responsible not only for the blueprints, but also for how it will look "in metal," how it will prove itself in action, for the consumer. This is why the scientific associates hastened to the plant shops in the morning, and this is why an older worker listens attentively to a young girl in jeans who has come to him with her calculations. Together they are responsible for the success. Do-nothings are exposed immediately and superfluous people are not kept here.

What does the manager of the enterprise usually do if the production is not proceeding as it should? He convenes a conference (operations meeting, planning session, 5-minute meeting) and figures out which of the chiefs of the subdivisions is to blame for the interruption, asks about the causes and, having "brainwashed" the guilty person, demands that within 3 days (weeks, 10-day periods) the situation be rectified. If nothing has changed after that time is up the procedure is repeated with certain variations. What does V. P. Belyakov do in such a situation? At 7 in the morning he comes directly to the shop where he is already awaited by designers, engineers and technologists, and together with them he begins to figure out what is what. As a rule, it is not necessary to convene such a representative concilium twice regarding the same issue.

Viktor Petrovich speaks ardently about the technical problems of production, sometimes stopping in mid-sentence: how could he say it more simply? His somewhat hoarse voice sounds jerky. He speaks as though he were waiting for objections or had already heard them—each phrase is an attempt to prove something. This polemical manner was developed, apparently, because all of his life he has had to prove, persuade, and fight against the opposition.

I asked him if he did not miss those times when he was simply the manager of an institute. And I heard an unexpected response: "What do you mean, there I was not responsible for anything!..." Such familiar words and in such a completely unusual context. (Later, in conversations with specialists of the association the word "responsibility" would be heard frequently, and it is no longer surprising." Somebody else might be suspected of desiring to produce an effect, but people who work with V. P. Belyakov assert that the general director never puts on airs.

It frequently happens that a scientist creates a situation which could be a new phenomenon in industry. But without the opportunity to embody the idea in metal he helplessly watches the years go by before his brainchild sees the light of day. This helplessness of the director of the institute, a "manager with his hands tied," as Belyakov defined his former position, made him dissatisfied. Viktor Petrovich is convinced that in the area of cryogenic machine building responsibility for new technical equipment is placed on him personally. Such is his position. This responsibility forces the general director to fly from one end of the country to the other to a related enterprise where something is not going right. And not because they have asked him about this but because the common cause is suffering and it is necessary to figure out the problem and render assistance.

If the future is with scientific production associations as the most effective form for the achievement of progress in industry, it is also with such managers as Belyakov. Apparently the very essence of the NPO as a symbiosis of the scientific research institute and the plant requires that the general director of the association combine a desire for the new, creative risk, and the original solutions of a scientist with the efficiency, exactingness and caution of an administrator.

The sage Pythagoras made this appeal: "Stay with a person who carries his load and not the person who lays it down." V. P. Belyakov is one of those managers who "carries his load."

Several years ago Kriogenmash manufactured an air separation installation for one plant. Having worked for the intended amount of time, it stopped. The plant workers went to Balashikha to have a new one manufactured just like the old one. But during the years that had passed the association had modernized these installations three times. They had become better and larger. The clients ended up in a difficult position: the new installation was several meters higher than the old one and it would simply not fit in the building intended for it. To construct the building from the beginning would mean to halt production....

What would another manufacturer most likely have done? He would have sympathized and sent them on their way--he has enough problems of his own. And he would have acted correctly, in no way transgressing the code of relations between supplier and client. But V. P. Belyakov, instead of saying "Good-bye," said: "Let us look for a solution." He asked that they send the plan and the cross-section of the building, he took the plan for the installation and gave instructions for some things to be changed in it. As a result, the client received an air separation aggregate which fits perfectly

within the walls intended for it. "(I note) that while finding a solution for the client V. P. Belyakov took on additional concern for himself: since the installation is unique the state committee for prices will not give permission for payment either at the minimum or at the maximum."

A very attractive feature about the general director is his orientation toward technical equipment the need for which will not arise until tomorrow. Even when he was director of the scientific research institute Belyakov "bothered" his coworkers with this declaration: "Energy engineering has reached its limits with respect to a number of parameters. I think that it is time to deal with superconductivity, more precisely—deep cold and helium." He took responsibility for drawing up the plan and beginning the development. Then in 1971 when the scientists and specialists in superconductivity turned to the Kriogermash workers Belyakov already had the results of 3 years of research.

The decisiveness with which Viktor Petrovich takes on new tasks causes surprise and confusion in many people: it is so easy to fail at something new.... But in general the new is always more difficult. In 1974 the metallurgists were urgently requesting that they solve the problem of applying oxygen for the converter method of smelting steel, and they went to the Kriogermash workers for assistance. This was something new, and industry had not yet produced such equipment. And the most natural thing for the director to say was: "All right, let us prepare the technical documentation, make an experimental model, test it, and then we will put out a small series. This would take years. Many people think that V. P. Belyakov entered on a technical adventure. But industry immediately received 10 KAR-30 oxygen-argon installations.

After thinking more deeply about this and similar episodes from the life of the NPO one becomes convinced that, no, this is not adventurism. Behind such an approach lies profound competence, technical intuition and that which predetermines the success of a manager—a collective of people who think alike.

At the operations conference which Belyakov conducts on Mondays all questions are discussed on the basis of a clearly formulated proposition: "Soviet cryogenic technical equipment should be at the level of the requirements of the time, regardless of the position of its manufacturer."

"Interesting!" the reader will say. "After all, the NPO in Balaskikha is not the only enterprise in the country that produces cryogenic equipment. They would do better to think only about their own products!"

But leading specialists of Kriogermash discussed the introduction of "their" plans for new technical equipment also at the plant in Sverdlovsk, which is not a part of their association. This is why among the sets of equipment which use the corrugated plant heat exchangers that were recently created in Balaskikha we see items manufactured thousands of kilometers away from the NPO in related enterprises.

It is curious that the weekly operations meeting in the NPO are not universal-dispatcher meetings, but have a special purpose. At these they consider

large-scale thematic issues. Small problems are resolved on the spot and not put off "until Monday." The fact that the operations meetings are devoted to one subject helps to single out individual problems of cryogenic machine building as a whole and considered them from various standpoints, and sometimes to see from a new standpoint the shortcomings in their own work and make decisions to eliminate them, and it also gives invaluable information to engineers and designers as well as chiefs of production subdivisions concerning what they will be working on in the future. And, what is especially important, these conferences perform an educational function. They develop scientific and technical culture in young specialists and a desire not to grab onto the tale of technical progress.

It sometimes happens that lessons in ethics and esthetics are given at the operations meeting. "I saw a new installation," notes the director. "I was embarrassed. The machine itself was adjusted down to microns, but the wheel attached to it was made with coarse seams. The client will accept it because he has nothing to choose from, but how can we respect ourselves after something like this?..."

In the corridor of the second floor across from the division for planning and prediction of new technical equipment there hangs the "Instructions" of Peter I which have been copied from somewhere. "All projects must be very correct so as not to waste money and cause harm to the homeland. And anyone whose projects are drawn up carelessly I shall deprive of his rank and have him whipped"... These "Instructions" were posted by local wits not simply for their content, but with a hint of the "style"... Try to do anything not "very correct" and you will not know where to hide: the director will not pay any attention to your rank if he sees that you are not concerned about your work. Incidentally, people here are not offended by Belyakov's zeal. They know that he will not scold them for nothing, and if they have made a mistake it will eventually be corrected and they will be excused. Fairness is a quality that is especially valued in him.

True, there was a time when I as an outsider had some doubt about the fairness of the director. An operations conference was going on. As usual, the chiefs of the subdivisions responded quickly and specifically. And suddenly one of them announced that new blueprints had arrived for an item that was already being produced and the design service demanded that everything be done all over. And the deadlines for delivery were approaching. V. P. Belyakov asked the chief of the design division to give an explanation. The following was explained. This chief was on a business trip at a plant for which the installation is being manufactured. Here he saw that a new set of equipment would be on the platform and this could cause changes in the conditions for its operation. When he returned he gave instructions to the designers to make the corrections in the blueprints, and this was efficiently done. But the plant workers, naturally, became stubborn; in the first place, the parts of the aggregate had almost all been manufactured, and in the second place, the delivery deadlines were being threatened.

"After my trip to the plant I understood that the installation there could not operate optimally. I was obliged to change the blueprints," the designer was convincing, "and I would be responsible for the operation of the equipment..."

"And who will be responsible for the failure to meet the delivery deadline?" the general director asked severely. "Through your actions you are disorganizing production and you should be responsible for that!" And then, addressing the production service, he concluded: "Continue to manufacture the installation according to the old blueprints."

Yes, I expected that he would find another solution to the problem....

Still, a month later, when the installation had already been sent to the client, I asked:

"Viktor Petrovich, are you sure that the designer was wrong at that time and that the position on the platform did not influence the operation of the equipment?"

"I am sure. In the first place, I myself had visited that plant and, in the second place, it is necessary to do everything promptly. But we did not throw away the new blueprints. We are manufacturing another installation taking into account the corrections that were made."

Such was his decision. Of course it was well thought out and of course it was made with a knowledge of the situation. Then, at an operations meeting, Belyakov added one thing--the understanding that the delivery deadline must be the law, regardless of the circumstances. Hence the severity and hence the simplicity of the decision.

I asked those who work with Viktor Petrovich which of the general director's characteristics contributes most to his authority. And I received the answer: "His definiteness." When V. P. Belyakov says "Yes" under any conditions it means only "Yes." And "No" means precisely "No." Therefore if a worker who has come to him with a request hears: "I will do everything I can, come back in a week," he can calmly return to his machine tool and devote himself to his work without thinking any more about the problem. Within a week the director will tell him what he has done. And one can be confident that he has done everything possible. This does not mean, of course, that any request will be fulfilled. Sometimes Belyakov says: "Here I can do nothing--even directors are not omnipotent!" Even if the person goes to different levels of authority, he will not be sitting in the waiting room. Definiteness is a necessary characteristic of a manager.

Incidentally, the general director receives people concerning personal problems each day--from 8 until 6. So during the course of a day if they have a free moment both a worker and an engineer can drop in on him. And the polite secretary calmly and kindly will say: "Wait a second, I will find out." And then: "Go on in, Viktor Petrovich is waiting for you."

Initially when some people saw how accessible the director's office was they tried to derive some kind of advantage from this. A person would come in and say: "Viktor Petrovich, do you know that so and so is doing such and such..." The director would immediately call in "So-and-so" on the loudspeaker and say, turning to the informer, "Repeat everything you told me and we will straighten

this out together." One or two lessons like this and the "well-wishers" understood that the director's ear is not for rumors.

Viktor Petrovich recalls this not in passing, but seriously, as a problem which impeded the work and now has been favorably resolved.

"Do you understand how important that is for a normal atmosphere in the collective?" he asks. Behind his glasses is a quick, steady gaze. You never know whether he is teaching you something or laughing. Most likely he is doing everything all at once. I can imagine how that affects an opponent. The former deputies of Viktor Petrovich, those who "did not work out" and did not want to or could not submit to his demandingness probably felt uncomfortable under this gaze.

Today Belyakov has good deputies, people who are capable of solving any current problem. Almost all of them have been working there since the day the association was created. Viktor Petrovich has helped many of them to find themselves, and to learn how to work in science and management of production. It sometimes happens that people leave Balashikha with a significant promotion. One of them, Vladimir Yegorovich Kurtashin, is now in charge of the all-union production association Kriogermash. In his discussion about the association where he has not worked for a long time one still hears the words "we" and "our." And this is not surprising: a large part of his life is linked to Balashikha: he came here as a worker and traveled the path from foreman to the deputy general director.

It would be ridiculous to say that absolutely everyone has liked and does like V. P. Belyakov. There are people who have left Kriogermash not at their own request—it was necessary to get rid of them because the work was suffering. Some of the production managers even when the NPO was created, not wanting to be subordinate "to some professor" submitted their resignations to make a point. Viktor Petrovich signed them, thinking that if they had such arrogance there would be no point in keeping the worker. Then one of them recognized that he had become too upset. But time cannot be turned back....

Time is everything for the NPO. But if the problem were simply not to fall behind schedule, in Balashikha they would have the right to think that they have no problems. Another thing bothers them: the imperfection of planning, for example. The association has been in existence for 13 years, and for 13 years its general director at all conferences, meetings, gatherings and seminars says that it is an absurd situation when one part, the institute, is given a thematic plan that is supervised by the State Committee for Science and Technology and another part of the same NPO, the plants, is given a production plan that is supervised by the USSR Gosplan. The results of the scientific production activity of the association are evaluated only in terms of the volume indicators, without taking into account the technical equipment it creates—whether it is of the world class or is outdated. Changes have now been earmarked—as they say, "Thank God!"

The general director devotes a good deal of effort to interpreting the experience of his own NPO. Viktor Petrovich placed before me a thin brochure. I read the title: "Management of science and production with the creation of

new technical equipment of the highest world level." This was a preprint of his article for the scientific and practical conference in Tallinn. Next to it on the table were the pages of a typed text. These proposals for improving the system of management and planning were prepared by Belyakov for a conference on scientific and technical progress in the CPSU Central Committee. One's eyes fall on the words: "The general director is faced with a choice...." And it seemed that, taken out of context, this phrase defines fairly precisely the essence of his work: for a decision is always a choice. And it is a happy person who is not always having to choose between the used-up "yesterday" and the unknown "tomorrow." Between the convenient compromise and the inconvenient adherence to principles. Between the comfortable middle and the risky edge. Happy is the person who, like Viktor Petrovich Belyakov, has made his choice once and for all.

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POSSIBILITIES OF FUTURE PROGRESS DISCUSSED

Novosibirsk *EKONOMIKA I ORGANIZATSIYA PROMYSHLENNOGO PROIZVODSTVA* (EKO) in Russian No 4, Apr 86 pp 75-77

[Article by V. S. Gorshkov, director of the Giprokislород Institute (Moscow): "There Is a Basis for Another Leap"]

[Text] In the Giprokislород Institute the functions of the creation of designs for the construction of cryogenic technical equipment are centralized. Plans for its own ministry, the chemical industry, and for whose enterprises we are the general planner comprise 10 percent of the overall volume of work. The rest of it is work we do on the technological part of the plans on a subcontracting basis for other ministries and departments. In interrelations with the suppliers of cryogenic equipment the institute represents the interests of the clients.

A responsible moment has now arrived in the replacement of installations for obtaining products from the processing of air, which we have been working for for 20-30 years. It is necessary to take advantage of this moment in order to take a new leap forward. The technical equipment produced by Kriogermash creates a reliable foundation for such a leap.

We have been quite unjustifiably accused of being behind in the utilization of nitrogen. After all, the equipment that is produced makes it possible to obtain the complex of products from processing errors. In foreign countries inert gases are widely used for storing food and agricultural products. In the environment of an inert gas such as nitrogen the processes of decomposition are curtailed.

The obstacle to the utilization of nitrogen is not the lack of equipment, but the slow construction of the corresponding buildings for storing agricultural products. As part of the air separation installations for the Karaganda Metallurgical Combine we have planned a block for producing pure nitrogen. In Dzerzhinsk for the production of caprolactam we have planned a block for supplying nitrogen to a whole range of consumers. Plans for blocks have been created for the Western Siberian metallurgical combine and the Nizhnekimsk Petrochemical Combine. Pipelines have been envisioned for transporting the nitrogen to the place of consumption over short distances. The plan which we have called "Izotermik" was created by our institute in conjunction with the

Moscow Technological Institute of the Food Industry. For more than 10 years now this institute has been dealing with problems of storing food products in an environment of inert gases. We tested the technology they proposed at a plant of our main board in Dnepropetrovsk and became convinced of its effectiveness. But we have not found any consumers yet. There are several reasons for this. The main ones are the lack either of initiative or of capital investments.

It would seem that the new storage facilities should be designed immediately, taking into account the creation of an inert environment in them and they should be located near the sources of nitrogen. Here is a simple example. On Karavinskiy Highway in the outskirts of Moscow at the TETs there is an oxygen installation which has discharged nitrogen. Next to it is a loop highway and railroad sidings, that is, all the conditions for the construction of a storage facility with an inert environment.

We have not ruled out the possibility of creating an inert environment in existing storage facilities. But to do this it is necessary to solve the problem of sealing the buildings.

It is possible to regulate the environment of inert gases in storage facilities by three methods: with the help of membrane films which have a selective capability of letting one or another gas through, by combustion of natural gas, and by the utilization of discharged nitrogen. The third method is the least expensive and is available to almost all regions where there are metallurgical and chemical plants near the storage facilities. The Moscow Institute of the Food Industry has developed methods of storing sunflowers, berries and cotton in a regulated nitrogen environment and has patented these abroad. One must assume that we shall be the first to introduce these methods.

The next important problem which must be resolved now is the reduction of capital investments for the replacement of air separation installations that have outlived their time. One can preserve the existing buildings and foundations, but to do this it is necessary for the larger air separation blocks to fit into buildings of the same sizes. Now it is necessary to raze everything right down to the foundations and to begin the building from the start. It is possible to increase capacities with the same sizes of buildings if the Kriogermash NPO will improve the process of heat and mass exchange. The problem of improving the technological process of heat and mass exchange is being solved abroad utilizing reverse plate heat exchangers. Their production has been arranged in the NPO.

There are problems of providing instruments for installations for obtaining products from processing air. The branches that supply batching items must pay more attention to the orders from Kriogermash.

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GAS DIVISION CHIEF INTERVIEWED

Novosibirsk *EKONOMIKA I ORGANIZATSIYA PROMYSHLENNOGO PROIZVODSTVA* (ENO) in Russian No 4, Apr 86 pp 77-80

[Interview with I. Ye. Spirkach, chief of the gas division of Gipromez (Moscow): "Responding Efficiently to the Needs of the Branch"]

[Text] [Question] Ivan Yemelyanovich, ferrous metallurgy is the largest consumer of products from air separation. We should like to hear from you about the degree to which the branch's need for cryogenic equipment is being satisfied and what are its quality and technical level.

[Answer] Yes, our branch produces and utilizes 50 percent of the oxygen produced in the country. It is also the largest consumer of argon and nitrogen. Metallurgists traditionally have stable contacts with the manufacturers of cryogenic technical equipment, who have always responded efficiently to the needs of the branch.

No other country consumes as much oxygen for enriching furnace blasts as we do. We have fairly high achievements in the area of intensification of the process of smelting and in economizing on fuel and energy resources, particularly coke. For the largest blast furnace in the world, in Krivoy Rog, Kriogermash has created a unique water separation installation producing 70,000 cubic meters of oxygen an hour, which has no analogues in the world.

During the 1960's the NPO developed the large KAR-30 aggregates (oxygen-argon equipment with a capacity of 30,000 cubic meters of oxygen and 360 cubic meters of argon per hour). They made it possible to fully provide the oxygen converter production that was just beginning to develop with high-purity oxygen—99.5 percent—and argon for processing metal. A significant role in metallurgy was played by the KTK-3 equipment, which could be used in converter, blast furnace and Marten furnace productions.

During the 1970's when there was a greater demand for pure nitrogen for thermal processing of high-quality rolled metal Kriogermash assimilated the production of new aggregates—the KAA—for processing pure oxygen and especially pure nitrogen. In order to convey an idea of the degree of purity of the nitrogen suffice it to say that there were no more than five particles of oxygen per 1 million parts of nitrogen. Only under such conditions could

they ensure the given quality of the metal products. The equipment produced by the NPO fully satisfied these requirements.

The installations created in Balashikha are distinguished by their high level of reliability and durability. This fact is remarkable. At the Novolipetsk Metallurgical Combine there were in operation two air separation installations which were acquired along with oxygen converter equipment that had been purchased. They operated for 17 years and then broke down. They could not be repaired or restored. At the same time, individual air separation installations from Kriogermash operate for about 30 years.

[Question] Does this mean that there is no need for importing cryogenic equipment?

[Answer] No need whatsoever. And nobody especially acquires it. But when some set of metallurgical equipment is put into operation the deliveries include air separation installations, as was the case at the Lipetsk Metallurgical Combine and as happened quite recently with the acquisition of equipment for the Belorussian Metallurgical Plant in Zhlobin. Here we knew beforehand that the service life of the air separation installations we had acquired was calculated at 8-10 years. After that we shall replace them with domestic ones.

[Question] Do you not find a contradiction in the fact that with respect to consumption of the products from processing air our ferrous metallurgy is first in the world while with respect to the proportion of oxygen converter production we are not on a level with some economically developed countries?

[Answer] No, I do not see any contradiction in that. We have the largest metallurgical production in the world and we hold first place in terms of smelting iron and steel, and therefore we are the largest consumers of products from air separation for metallurgy. But with respect to the volume of smelting steel by the oxygen converter method we fall somewhat behind individual countries.

[Question] What is keeping us from developing oxygen converter production on a larger scale? Is this not related to the shortage of equipment produced by the Kriogermash NPO?

[Answer] It has nothing to do with the NPO. It has promptly prepared for producing the oxygen argon installations necessary for converters. At one point it even had difficulties in production because it was intended for a large volume of orders and the capacities turned out to be underloaded.

The somewhat slower changeover to the converter method of steel smelting is linked to the large fleet of powerful Marten furnaces in which significant investments have been made. Thus it is possible only gradually to remove the Marten furnaces and replace them with converters. In the 12th Five-Year Plan and up to the year 2000 we shall reconstruct metallurgical production, which is discussed in the Basic Directions for the Economic and Social Development of the USSR During 1986-1990 and the Period Up to the Year 2000.

[Question] What do metallurgists expect from cryogenic technical equipment in order to solve the new problems?

[Answer] The need for equipment for obtaining products from the separation of air is now increasing significantly since it is necessary to replace installations from the 1960's-1970's, and in some places even sets of equipment from the 1950's.

While previously we were oriented mainly toward obtaining oxygen, now there is the problem of comprehensive utilization of products from the separation of air. It is not a simple problem. It means not only the utilization of all components from the separation of air, but also efficient satisfaction of other enterprises and even productions of other branches that are in the zone of activity of the large metallurgical plants and combines. It is costly and impractical to create small air separation installations everywhere while it is possible to obtain everything necessary with effective utilization of the large ones. This is precisely the path by which one can achieve great savings on capital investments and energy resources since obtaining products from the separation of air involves large energy expenditures. A large number of personnel will also be released.

The next problem on which specialists of the NPO will have to work in conjunction with their clients is more complete automation of processes of separation of air. For the Novolipetsk Combine we have received new technical specifications for equipping air separation installations with a microprocessor system for automated control. The automated equipment makes it possible not only to increase labor productivity and reduce labor expenditures, but also to conduct the technological process more reliably.

In order to raise the technical level and increase the reliability of equipment, not only the installation itself, but also the batching equipment must operate well. In our opinion, the centrifugal air compressors used for compressing air do not correspond to the modern technical level. More effective here would be the axial and axial-centrifugal compressors which make it possible to reduce the need for electric energy by 6-8 percent. On the scale of the branch this is a large amount.

There is also the task of raising the level of the plant readiness of the equipment. To do this its control assembly should be done by the manufacturer, which will make it possible to reduce labor expenditures on installation and to accelerate the startup of the equipment. In Zhlobin, for example, in the construction of the Belorussian Metallurgical Plant with imported equipment large sets of equipment were delivered on trailers, put in place and immediately put into operation.

There are complaints about the quality of the valves and the heat exchangers. Specialists of the Kriogermash NPO are working on eliminating these shortcomings. They have familiarized us with the program for creating a new

generation of air separation equipment which will provide for comprehensive acquisition of products and will be less energy-intensive and labor-intensive in operation. It seems to us that this equipment will correspond to the tasks and the growing demands of metallurgy.

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CAREER OF OXYGEN PIONEER DESCRIBED

Novosibirsk **ENOMIKA I ORGANIZATSIYA PROMYSHLENNOGO PROIZVODSTVA** (END) in Russian No 4, Apr 86 pp 81-93

[Article by Yelena Lysaya: "The Director of Oxygen"]

[Text] Several pages, difficult pages in the life of Academician Petr Leonidovich Kapitsa are associated with oxygen, a time when the joy of discoveries and the bitter days of struggling to have these realized were bound together in a tight knot. But these were bright and instructive pages which revealed in the eminent scientist the talent of an engineer, the temperament of a fighting man, and the extraordinary capabilities of an organizer and a leader.

Many of those who knew his work during that period called him the "director of oxygen." While heading the academic institute and supervising fundamental research, at the same time he was developing and creating installations for obtaining inexpensive industrial oxygen; he organized on completely new principles the interdepartmental main administration for carrying out the oxygen project—Glavkislород—and he was in charge of it himself; he accomplished the opening and subsequently was the first director of the All-Union Scientific Research Institute of Oxygen Machine Building, the forefather of all scientific research institutes of cryogenic equipment and enterprises; he created the Giprokislород Planning Institute; he put into operation the first specialized plant for oxygen machine building, if at first only in adapted facilities of repair shops in the region of Luzhniki; he trained the cadre of specialists; he publicized the new technical direction in the press and in public speeches...in a word, he was the "director of oxygen."

"He Is Straining for Action..."

When he returned to homeland in 1934 after 13 years of apprenticeship with the world-famous English physician Ernest Rutherford, his attention was drawn to the act of discussion in the press of problems of obtaining inexpensive oxygen which were close to his scholarly interests. By that time Petr Leonidovich Kapitsa was a recognized scientific authority in the world—an active member of the Royal Academy of Great Britain (Academy of Sciences of Great Britain) and a corresponding member of the USSR Academy of Sciences (5 years later, in 1939, he was elected an active member of the USSR Academy Sciences). In

Cambridge University where he had worked on the problem of strong magnetic fields and, in this connection, on the problem of low-cryogenic-temperatures, since many magnetic phenomena are manifested in an interesting way at low temperatures, a laboratory was created especially for him. When upon returning to his homeland he was appointed director of the Institute of Physics Problems of the USSR Academy of Sciences, which was created under his guidance, with the help of Razorford he managed to acquire all the equipment for this laboratory.

While conducting research and having made calculations he became convinced that the installations in operation and industry at that time were incapable of producing a large increase in oxygen since, because of the high pressure (up to 200 atmospheres) in them it was impossible to increase the capacities of the basic sets of equipment—compressed-gas piston engines—in which the gas is cooled. And it was economically inexpedient to construct an immense number of compressed-gas engines of the usual capacities. He came to the conclusion that the future lay with turbine machines—turbocompressed gas engines—and the changeover to a low-pressure cycle of 4-6 atmospheres, which will make it possible to construct air separation installations of whatever side is needed. His conclusions were published in the press.

From the Correspondent's Notepad

Up until 1930 the need for oxygen in our country was satisfied mainly with air separation installations that were purchased. The first domestic ones were created in 1931, but they simply copied conscientiously the design of the machines of the well-known German firm Linde. Yet the rapidly developing Soviet industry was experiencing "oxygen starvation" in the literal sense, since claims for oxygen were being made by more and more new branches of technology in which it could serve purposes of intensification of production.

"The professor is fantasizing—all this is extremely unrealistic and far removed from modern ideas,"¹—such were the statements of engineers and specialists concerning the paths he suggested to creating new technical equipment for obtaining inexpensive oxygen, while several years later, as Petr Leonidovich Kapitsa himself said, everything began. "Today I know that with that creative research I had outlined all the work which I myself did during the past 4 years as an engineer and which, as I initially suggested, should have been done by our industry. I would have had the right to discuss this theoretical work if I myself had not been engineer, if—I shall not try to hide this—I had not been burning with the passion of an engineer. People say to me that those ideas which I am advancing as a scientist are unrealistic. I decided to take another step forward."²

In a year and a half in his institute he had created an experimental installation using the new principles. All of the theoretical tenets he had expressed were justified. But even in this stage he had not done enough, although the governmental board of experts had given the machine a high evaluation and the decree of the Economic Council of the USSR Sovnarkom had ordered one of the plans to develop this matter further.

A new difficulty had now arisen—cooperation with industry.

To strive for the lofty and sublime
Alas, our daily affairs prevent us,
And if our annual plan is fulfilled
Our higher good is in our dreams.³

Thus paraphrasing the lines from "Faust" he parodied that administrative collision which he encountered in the plant. The realization of scientific truth was accompanied by an awareness of administrative truths. But, like Goethe's hero, he was not stopped before the obstacle. "He strains for battle, loves to leap barriers, and sees his goal flickering in the distance...."⁴ His efficient, disciplined style of thinking led the eminent scientific experimenter to an objective evaluation of the situation and enabled him to draw the necessary conclusions.

Conclusion No 1: Specialization is needed. "The overall attitude of the plant collective to the new assignment could not be called hostile. It recognized the advantage and interest of the new, but the workers of the plant had simply not come to look at it as a reality. They were involved with daily concerns and, the main thing, the fulfillment of the main plan of the plant. Of course, our installations took a great deal of effort, they impeded the fulfillment of the plan and because of their scale, as a small production, they played no role whatsoever in the plant's annual balance."

Conclusion No 2: "Our plant industrial organization is not sufficiently adapted for rapid and smooth assimilation of new ideas in technology. But I have no doubt that with our economic system it is possible to find and create those organizational forms which would open the possibilities for smooth and rapid introduction...."⁵

Conclusion No 3: "It must be admitted that in our industry there is little room to engage in the creation of appropriate cadres for realizing new technical equipment. This, one must say frankly, is a great shortcoming of ours, and it is necessary to fight against it." In one of his articles in PRAVDA he expressed himself even more definitely: "Successful 'development' of new ideas should be entrusted not to the rank-and-file engineer, foreman, worker and so forth, but to a well-developed, highly skilled creative collective."⁶

These were not the conclusions of an outside observer. He himself had engaged in the search for the necessary organizational forms and he himself had worked on the development of the production of technical equipment for obtaining oxygen and the creation of skilled collectives capable of receiving and producing new ideas.

"During this period, at the end of 1940, I came to his attention, being a student in the last course of the Moscow Higher Technical School imeni Bauman," recalls Lenin and State Prize winner, the head of the cryogenic division of the Physics Institute imeni Lebedev of the USSR Academy of Sciences, Dr of Technical Sciences Abram Borisovich Fradkov. "Kapitsa's deputy for personnel in the Institute of Physics Problems, Vera Aleksandrovna Stetskaya, a woman of unusual energy and drive, "scrutinized" me and Igor

Borisovich Danilov among the graduates of MVTU. Probably she was attracted by the circumstance that before coming to study in the VUZ I had completed the FZU, had worked in a shop, and then had worked as a designer. Kapitsa took all the rest of the steps himself. He went to the highest government level, taking advantage of all the authority that had been given him to create a skilled engineering body and the production of air separation installations. Danilov and I were sent to the Moscow Autogenic Plant where turbo compressed-air engines were manufactured. There with Kapitsa's assistance they had already organized a special design bureau and a special production. I completed the automotive tractor department of MVTU and was invited to work in a group that was engaged in the creation of mobile installations mounted on motor vehicles.

The war brought a halt to our work. The plant was evacuated to Sverdlovsk and Igor Danilov and I were sent to the military commissariat and then to the front.

Glavkislород

But the war created an even more critical need for oxygen for aviation and industry. Fradkov did not know that following on his heels was an order to seek him out and send him to Kapitsa. This paper caught up with him at the moment when, after short-term courses for pontoon engineers he arrived at the military unit where he was assigned. They found Danilov also.

Kapitsa was not bothered by the fact that these were quite "green" engineers or that they had not completed the institute in the cryogenic specialty ("Never mind, we will requalify them," he responded to their doubts), but he believed in them when he saw how great their interest was in engineering creativity.

Some people tried to find jobs for their relatives and acquaintances with Kapitsa, but he would not hire anybody for the sake of friendship. "You know, we have dirty work," he would answer in refusal.

"Thoughts about how best to combine science and technology engaged Petr Leonidovich in his entire life, even when he had already left practical work in industry. But during the 1940's he lived for this and everything he did at that time was in the service of these ideas," says Dr of Physical and Mathematical Sciences, winner of the Lenin and USSR State Prizes, Mikhail Petrovich Malkov. "I met him under the most difficult conditions of the evacuation in Kazan. The city was a real academic mecca. There were academic institutes from Moscow and Leningrad here. Having learned that I was working on research in the area of separating gases he came to me so persistently that I was unable to refuse him although before then I had never even thought about leaving my native Leningrad.

"The turbo compressed-air engine group--Fradkov, Danilov, Zeldovich and I at the end of 1942, along with Petr Leonidovich, returned to Moscow. We studied problems of durability and length of operation of air separation installations. Each result that was obtained was taken into account when designing and assembling the installation for 200 liters of liquid oxygen per

hour in the Institute of Physics Problems and the first powerful installation for 2,000 liters in Balashikha near Moscow. The startup of these machines confirmed the correctness of Kapitsa's scientific ideas and enabled him to realize the organizational idea he had suggested for combining science and technology—to create Glavkislород.

...Here in the Institute of Physics Problems on the former Vorobyev Highway (now Ulitsa Kosygina), where we were speaking with Mikhail Petrovich, the entire oxygen program began—research, experimental installations, and even new organizational structures for realizing the oxygen project—the Central Design Bureau. It was organized in such a way that it produced a colossal return, in spite of the crowded facilities and the difficulties of wartime.

"In the Glavkislород Special Design Bureau there were 20 of us headed by the talented engineer Aleksey Mikhaylovich Gorshkov. But this small collective managed to provide production with plans," says Dr of Technical Sciences Sergey Ivanovich Sergeyev, who came to the Glavkislород Special Design Bureau in 1944 after completing the institute. "There was no separation of designers from researchers in the design bureau—everyone worked together on a machine until it became a reality. Now there has been a separation of research and design work in applied scientific research institutes. People do not acquire the great skills and there is a loss of effectiveness. During the last decades there has been a continuous internal dispute: who goes first—the designers or science? I think the one should go first who has the clearest head. We had our work arranged differently. But in the creative plan it was better at that time when about half of the time was spent on production."

To this day people recall Glavkislород as an original and brilliantly sparkling star. It is recalled with a certain amount of nostalgia, as a unique and unpeatedly phenomenon, although time is dictating the need to return to its experience not for the sake of pleasant recollections but in order to repeat a good deal of it right now, when searching for the most effective forms of integration of science and production.

Glavkislород, which was created in 1943 under the USSR Sovnarkom, was an interdepartmental organization. Its goal was not only to manage the daily operational activity, but also to work for the future. It engaged in the consolidation of all scientific and technical forces in order to carry out the oxygen program. But for the manager, Academician Petr Leonidovich Kapitsa, the program was broad and clear-cut: to create oxygen equipment on the basis of new principles, to develop specialized plants and scientific research and planning organizations, and to determine the prospects along with the leading scientists and specialists from other branches of science and technology—what we call today "work with the consumer," frequently not investing in this concept all the immense meaning which Kapitsa attached to this work. For him the knowledge of the demands of the consumers are the most important condition for the development of the production of oxygen equipment.

At one time, when he was a client for the installations, his connections with the plants left him with a feeling of immense discomfort: "Alas, up to this point the psychology of our plans could be characterized this way: the consumer is a hog—he will eat everything," he wrote in 1984 in one of his

scientific reports to the economic council of the USSR Sovnarkom concerning the assimilation of the production of air separation installations.⁷

The brain center of Glavkislrod was the technical council, which Kapitsa headed himself. The largest scientific and production problems were brought up for consideration here.

"I think that for Petr Leonidovich my duty as a scientific secretary of the technical council was even more important than the position of deputy chief of Glavkislrod, which I occupied," recalls Candidate of Technical Sciences Aleksandr Sergeyevich Fedorov, sector chief of the Institute of the History of Natural Sciences and Technology of the USSR Academy of Sciences. "He checked to make sure that the meetings of the council took place regularly, twice a month, and he always conducted them himself."

The technical council consisted of 12 people. Its members were responsible people who represented those branches of the national economy which could become consumers of oxygen: metallurgy, chemistry, energy engineering, the pulp and paper industry and others. From the very first days it included Academician Ivan Pavlovich Barden, who at that time headed the division in Glavkislrod for the introduction of oxygen into ferrous metallurgy. Even before the war he had begun research in Dnepropetrovsk on the application of oxygen blasting in blast furnace processes, and subsequently he played a large role in the development of the oxygen converter method of production. His papers and articles attracted a great deal of attention. The council included people's commissars of ferrous metallurgy Ivan Fedorovich Tevosyan and of the pulp and paper industry, Mikhail Mikhaylovich Orlov, Academician Boris Yevgenyevich Vedeneyev, who was the deputy people's commissar of energy and electrification at that time, and others. Additionally, they invited to the meetings scientists and eminent specialists from those branches whose problems were being raised at that particular meeting. Sometimes up to 100 people participated in the work of the council.

The publication of the technical bulletin KISLOROD, where they published the most important papers and speeches of participants in the council and materials especially prepared for the bulletin, they attracted an even broader audience to the oxygen program. Petr Leonidovich entrusted Fedorov with the editing, recalling his editorial activity in the magazines TEKHNIKA MOLODEZHI and NAUKA I ZHIZN, where before the war he had been on the editorial board, and was also at one time the deputy and editor in chief (incidentally, Aleksandr Sergeyevich Fedorov is now one of the deputies of the editor in chief of the magazine PRIRODA).

"Today it seems improbable that Kapitsa did all that he did during the years of the organization of Glavkislrod and its institutions. But that all did take place and continues to live now, although it has changed its forms and titles. He did what was not within the power even of the heartiest of people. His father bowed before his energy, organizational talent, and his gifts as a scientist and engineer...."

That was said by the designer Nina Alekseyevna Gorshkova, the daughter of the first manager of the design bureau of Glavkislrod, Aleksey Mikhaylovich

Gorshkov. She has continued family traditions and works in the same organization as her father did, in the same position, in Luzhnetskaya Naberezhnaya, where the design bureau was transferred from the Institute of Physics Problems when Kapitsa acquired this territory for the experimental plant.

Here, in Luzhnetskaya Naberezhnaya, at the very end of the war, Kapitsa created the All-Union Scientific Research and Planning-Design Institute of Oxygen Machine Building (VNIImash) since by that time around the Institute of Physics Problems and Glavkislород and its subdivisions there were already consolidated enough specialists to form an independent scientific and technical organization.

"The word 'introduction' in the Russian language means that the movement forward takes place with resistance from the environment. We have become so accustomed to the notion that any new scientific achievement or achievement in technology encounters resistance when it is being assimilated that we have long been using the word 'introduction' without noticing that with this word we are describing abnormal conditions for the assimilation of new technology," noted Kapitsa in 1965 at a general meeting of the USSR Academy of Sciences. "When we begin to use the word 'assimilation' of new technical equipment, it is possible to think that we have reached normal conditions for its development."⁸

The organization of Glavkislород and its institutions and levels of authority comprises one of the most successful attempts to create normal conditions for the assimilation of new technical equipment. This should not be forgotten. Now, in the stage of acceleration of scientific and technical progress, this unification of large scientific-technical and production forces under the aegis of an academic institute can be a decisive condition for successful development of new trends in science and technology.

"It is necessary to turn academic institutes sharply in the direction of expanding work that has a technical direction and to increase their role and responsibility for the creation of theoretical fundamentals of principally new kinds of technical equipment and technology,"⁹ said General Secretary of the CPSU Central Committee M. S. Gorbachev at the June 1985 Conference of the Party Central Committee concerning acceleration of scientific and technical progress.

Of course, a good deal here is also determined by the personality of the manager of the academic institute, his position in life, and his attitude toward solving concrete practical problems.

When the Gardener Plants a Sapling...

"I met Petr Leonidovich for the first time during the war years. And this meeting determined much in my life for me. Under his leadership I developed an interest in theory, the investigatory approach, and a desire to combine theory and practice. One could only be surprised that such an eminent physicist could easily become involved in the daily technical tasks and not be averse to spending time on them.

"When Kapitsa invited me to work on the assembly of the turbo oxygen installation in Balashikha and then transferred me to Glavkislород I could observe from up close the zeal with which he engaged in his search for technical solutions. And this distinguished him from many managers I had occasion to encounter subsequently," recalls the winner of the State Prize, Dr of Technical Sciences Vilyam Feliksovich Gustov." For him scientific truth has already always been more valuable than an immediate practical result. In the seminars he conducted to analyze the course of the adjustment of installations he demanded that everything be stated. I think that such organization contributed most of all to the formation of the theoretical approach and evoked interest in the work.

"People were also attracted to him because he was a democratic and concerned leader. When they came to install an installation in Balashikha they frequently spent several days. He had an apartment here. If he stayed the night he did not leave the installation until the second shift had completed its work. If he went to Moscow he always asked 'Who wants to go with me?' and always filled his car up with people."

Nina Alekseyvna Gorshkova: "During the war I sometimes had occasion to visit my father in the Institute of Physical Problems where work was being started on the Glavkislород Design Bureau. Although I was just a girl at the time I recall how strongly I was impressed by the fact that the academician did not steer clear of any daily problems: he was interested in the living conditions for the families, how the plots were distributed for gardens, how the coupons were distributed for footwear and clothing...."

Sergey Ivanovich Sergeyev: "A good deal of time has passed since then and much has been forgotten, but the main thing remains in our memory. And this main thing was his methods of working with people, his daily, consistent disclosure and encouragement of the creative basis. He went to the design bureau each day and at least once a week looked over the shoulder of each designer whether it be the leading developer or a simple draftsman as I was during those years. He would stand there, look, and sometimes make a recommendation: 'Think about this.' He never ordered, but precisely recommended, sometimes about concerning a subject different from the immediate work. And this was also one of the ways of recognizing people and stimulating their capabilities. If a person had not carried out the technical task that had been set for him, he would not reproach him, but perhaps he would not go to him again. If a solution was found, the engineer could go directly to Kapitsa, bypassing his secretary. No one would stop him. Everyone understood that if you had gathered the courage to go into the academician's office it meant that you had business there. This was more encouragement than any bonus."

When a gardener plants a sapling,
The horticulturist knows in advance
what the fruit will be....

Abram Borisovich Fradkov: "Kapitsa was a great engineer and he valued engineering labor very highly. I recall how he spoke to us: 'Why the hell

should you take a half-year's leave in order to defend a candidate's dissertation? You are already being paid just as well as candidates of sciences are. You will have time to formalize your scientific work later when we complete the creation of the installations."

There really was a time when actual work for production could not be put off for the sake of personal goals. And the wages for engineers were even higher than for "degreed" young scientific workers. Now the labor of the engineer is no longer valued either morally or materially. A young specialist who has barely begun to work in a scientific laboratory must immediately begin to think about a dissertation. In my division there are four young women in engineering positions, and they are constantly changing.

From the correspondent's notepad. All of the "wartime foursome for turbo compressed-air engines" of the Institute of Physics Problems—Fradkov, Molkov, Zeldovich and Danilov—after a couple of years defended their candidates, and then their doctoral dissertations, received high government awards, and published a reference guide for cryogenic equipment which has gone through three editions and has become a handbook for specialists working with supercold temperatures. And this was even without Kapitsa.

"He was the father of cryogenic equipment not only in our country, but throughout the world."

The history of the personal participation of Academician Kapitsa in the development of cryogenic equipment breaks off in the year 1964. It breaks off unjustifiably crudely and abruptly, as if an emergency brake had been applied at full speed.

"And suddenly an abrupt turn of fate. There were people who did not approve of the institute's subject matter and let this be known. After a certain amount of time there began to work in the institute a commission whose duty was to look for shortcomings. Shortcomings were found. The turbo compressed-air method was abolished. The piston refrigeration machines were recognized as more advantageous than the turbo compressed-air machines. The style of work was declared to be faulty. Petr Leonidovich had to defend his institute."¹¹ This is what was written that period by the journalist F. Kedrov in his book "Kapitsa: Life and Discoveries."

An emergency brake can halt movement temporarily, but it cannot turn it back. Petr Leonidovich himself never returned to cryogenics. Even in the speech in 1978 when he was awarded the Nobel Prize for fundamental discoveries and inventions in the area of low-temperature physics he asked permission to depart from generally accepted traditions and speak not about the work that had been distinguished by awards but about the content of his scientific activity in recent years—high-energy physics. But his scientific ideas in cryogenics and the principles and methods of the creation of cryogenic equipment continued to live, proving the scientist's correctness through their development.

Regardless of how complicated the spiral may be in which progress develops, in each stage it enters a higher point. All of the declarations and statements

of proponents of the traditional methods of obtaining oxygen cannot mean anything in and of themselves when both types of installations have existed and industry has had the opportunity to compare.

Can one even imagine a return to piston aircraft after turbo props and turbo jets?! Thus just as in aviation, even earlier in engineering, the changeover from piston engines to turbine engines in cryogenic equipment was historically inevitable.

During the 1950's the entire world was involved in creating and utilizing air separation installations with a low-pressure cycle—the "Kapitsa Cycle" as they began to call it throughout the world.

Nine years later Petr Leonidovich returned to his Institute of Physics problems as director, but even before then he had begun scientific research there, moving what he had created in his dacha on Nikolinaya Mountain to the laboratory in which he conducted research on large capacity electronics. "The hut for physical problems"—the IFP, as his friends and co-workers jokingly called the laboratory, was transferred to the books of the IFP—the Institute of Physics Problems. But he never returned to the oxygen organizations.

"In 1946 the leadership of the VNIKinash was taken over by untalented people who began first of all to design piston engines at a time when the entire world, on the basis of patents for inventions of turbo compressed-air engines issued to Kapitsa in 1938 firms had already begun to develop turbo compressed-air installations. Even the forefather of the piston refrigeration machines, the German firm Linde, had gone over to the low-pressure cycle, having been convinced that the time of piston installations had already passed. We could have lost a great deal in the delay had it not been for the fact that under the leadership of Kapitsa we had created a large scientific stockpile. He made it possible to retain the positions that had been won in the world, and with respect to large air separation installation, even to pass up the leading foreign firms. A good deal was done to improve their design and blueprints by the developers of the NPO Kriogermash under the leadership of the corresponding member of the USSR Academy of Sciences Viktor Petrovich Belyakov," says V. F. Gustov.

"I am bothered by the fact that now we are living by utilizing existing scientific stockpiles of fundamental research in cryogenic physics. Science has not done enough in this area. There are inventions and fairly good results from applied research, especially in the Kriogermash NPO. It has had a good director for the past 17 years. He is what they call a person who works locally. But not enough scientific institutions are engaging in fundamental research. Some things are being done by the Kharkov Physics-Technical Institute and the Ukrainian SSR Academy of Sciences, and a little bit is being done by the Ural Scientific Center of the USSR Academy of Sciences. But this is not enough. We need a new spurt." This opinion was expressed by Dr. of Sciences Malkov.

"The area of cryogenic equipment has been fortunate. It has been headed by an outstanding Soviet scientist, Petr Leonidovich Kapitsa, who is the father of cryogenic equipment not only in our country, but in the entire world. His

fundamental discovery of the superfluidity of helium and his work in inventions concerning air separation installations and the liquefaction of helium are extremely large scientific discoveries of the first half of the 20th century." With these words Hero of Socialist Labor, Corresponding Member of the USSR Academy of Sciences, V. P. Belyakov, who had very briefly and thoroughly generalized the significance of what had been done by the "Director of Oxygen," wished to end the discussion.

FOOTNOTES

1. Kapitsa, P. L., "Teoriya, Praktika, Eksperiment. Stati, Vystupleniya" [Theory, Practice, Experiment. Articles and Speeches], second edition, Moscow, "Nauka", 1977, p 15.
2. Ibid.
3. Ibid., p 116.
4. Goethe, J. W., "Faust," Moscow, "Moskovskiy Rabochiy", 1982, p 34.
5. Kapitsa, P. L., "Teoriya, Praktika, Eksperiment...", pp 116-117.
6. Ibid., p 126.
7. "22 Scientific Reports by Academician P. L. Kapitsa," KHIMIYA I ZHIZN, No 5, 1985, p 55.
8. Kapitsa, P. L., "Teoriya, Praktika, Eksperiment...."
9. KOMMUNIST, No 9, 1985, p 24.
10. Goethe, J. W., "Faust."
11. Kedrov, F. "Kapitsa: Zhizn i otkrytiya" [Kapitsa: Life and Discoveries], second edition, Moscow, "Moskovskiy Rabochiy," 1984.

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KAPITSA SPEECH EXCERPTED

Novosibirsk *Ekonomika i Organizatsiya Promyshlennogo Proizvodstva* (EKO) in Russian No 4, Apr 86 pp 93-95

[Excerpt from speech by Academician P. L. Kapitsa: "Solving One Problem With All Available Means"]

[Text] P. L. Kapitsa spoke at a meeting of associates of the Institute of Physics Problems of the USSR Academy of Sciences on 3 May 1943 on the occasion of awarding a large group of associates orders and medals for successful work in the development and introduction of the new method of obtaining liquid air and liquid oxygen.

We are very proud of the fact that these awards were earned during the Patriotic War. It turns out that our work played a certain role in the fight against the hated oppressors, against the greatest enemy of human culture—German fascism.

In our country it means something special to obtain an award such as ours. From my experience in England I know that they grant awards there. There this event coincides with the birthday of the king, the beginning of the year, or some other celebrated date in history. But here the granting of awards coincides with the advantage produced for the country. Therefore the awards we grant have a quite special significance: it shows recognition of the work that was done by our institute.

Allow me to look back at that work which we have done. It began 6 years ago. And it is remarkable that it arose not out of any inventive idea which was developed in the purely design sense, but out of the idea of providing the country with inexpensive oxygen. Industry had achieved that level of development at which progress of many technical processes requires inexpensive oxygen. The study of the possibilities of obtaining it shows that the only way here is to liquify and subsequently rectify air. And since our institute had been working on refrigeration processes before this, bringing its research to the levels of the deepest cooling, to the temperature of liquid helium, the scientific analysis of the conditions for obtaining liquid oxygen turned out to be within the capabilities of the institute. We directed our scientific thought toward searching for possibilities of improving the processes of

obtaining inexpensive oxygen. This work was continued during all that time. The most difficult stage of it was at the same time the least effective, the least necessary to industry—this was the stage of obtaining liquid air by noon methods. This stage was the most difficult because it was linked to the development and testing of new ideas which we had invested in this process. Having completed this stage we began the next one—obtaining liquid oxygen by the new methods. This was the easiest stage, but also the most useful to the country.

Speaking of this work, I should like to take note of one interesting aspect, namely the method of work which we applied. Refrigeration equipment, generally speaking, has many paths of development and many paths are opening up before it. But the path the institute took and the one on which I directed it as the leader was the path of solving one problem using all available forces, directing all efforts into one point. As the commander in chief of our small army—the institute—I concentrated all forces on one problem, advancing only this one until we reached the end. The result of this was that almost all of our associates were to receive awards—this is explained simply: almost all of them participated in solving the basic problem facing our institute.

And now an important moment has arrived in our work—the time for introducing its results into industry. Work with industry is not easy: it is burdened with its own planning assignment and it does not have enough time to look for anything new. One must say frankly that it shrinks from everything that is new. But it turned out first of all that this is not a universal phenomenon: in our industry we found people who are interested in the new and love it. It turned out to be possible to work with them and involve them. With this kind of cooperation we created the installation for obtaining liquid oxygen, which was put into operation and is producing liquid oxygen on an industrial scale. Thus with the help of workers from industry we expanded our work to the plant scale. This scale would seem to be small, but the advantages of the new method make it possible on this small scale to achieve results which were previously possible only at plants that have large areas.

But here again I am faced with a very interesting question: with whom is it better for a scientist to work—with capitalist industry or with our industry, where is it best to introduce one's achievements—in a capitalist country or in ours. Many comrades are inclined to think that in capitalist countries industry responds more flexibly to the new and that it is easier to introduce scientific discoveries there. I have thought about this question a great deal and I must say that I do not agree with this point of view. First of all the position of the scientist who is working in capitalist industry is very difficult and unpleasant. My teacher Rutherford always told me that when during the process of working in the Cavendish Laboratory I would have some technical ideas: "Forget about technical equipment, Kapitza, and never work with industry because man cannot serve both God and mammon at the same time." But when one of our scientists raises a question about new technical achievements he is serving not mammon, but his own country. His work is imbued with a different spirit and it is evaluated differently. The psychological bases of this work are different. I would not have been able to begin to work in any "oxygen company" in England. But it was exceptionally

pleasant for me to work knowing that with my work I was producing an advantage for my country. As concerns industry, of course, it is difficult to accept the new, but, on the other hand, in the Soviet Union we have methods of influencing it and applying pressure on it which no capitalist country has. By taking advantage of these methods we are able to force our industry to accept the new. And in the future I see broad possibilities of developing science's influence on industry.

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LABOR ORGANIZATION DIRECTOR INTERVIEWED

Novosibirsk *Ekonomika i Organizatsiya Promyshlennogo Proizvodstva* (END) in Russian No 4, Apr 86 pp 96-111

[Interview with A. A. Prigarin, director of the All-Union Scientific and Methodological Center for the Organization of Labor and Management of Production of the USSR State Committee for Labor and Social Problems, Candidate of Economic Sciences, by L. Shcherbakova: "Certification of Work Positions: On the Path to a Statewide System"]

[Text] The Basic Directions for the Economic and Social Development of the USSR During 1986-1990 and the Period Up to the Year 2000 recognized the need to create a unified statewide system of planning, accounting, certification and streamlining of work positions and to provide for correspondence between the number of work positions and the labor resources in the branch and territorial cross-sections.

In the ninth issue of END for 1984 we discussed in detail the experience of the Dnepropetrovsk Combine Plant in certifying work positions and utilizing labor resources efficiently. As we know, this experience was approved by the CPSU Central Committee, which adopted a special decree (see PRAVDA, 13 November 1984).

The time has come for mass dissemination of certification at enterprises of the country. It is an interesting fact that the problem of efficient utilization of labor force and equipment was being worked on at several other enterprises of the country practically at the same time as the Dnepropetrovsk workers were dealing with it. The real situation that exists today in the national economy has urged on this work and raised it to the rank of a primary task for the majority of branches of industry. But this problem should not be enclosed within the framework of an individual enterprise.

At the same time the certification of work positions is only one aspect of the organization of production. In no way does it replace (nor can it replace) the introduction of the achievements of scientific and technical progress and other areas for improvement of industrial production. But it must occupy its own worthy position. For before earmarking a system of measures for improving the economy it is necessary to establish what we actually have at our disposal. Certification and streamlining of work positions contributes to this.

[Question] Aleksey Alekseyevich, what do you as leader of the Center for Scientific Organization of Labor, the head one for this problem, include in the concept of certification and streamlining of work positions? I am asking this question because in practice this sometimes means various things.

[Answer] You are right—on the pages of the press one can now read: as a result of certification and streamlining of work positions at such and such a plant they have introduced a new automated shop or a new automated line. And it is important to determine the relationship between streamlining, reconstruction and technical reequipping. Streamlining of work positions includes both technical and organizational measures. This is a complex of measures which the enterprise carries out with funds at hand, through its own forces or with a minimum of capital investments.

Perhaps it would be worthwhile to introduce a purely quantitative indicator that defines these concepts just as there now exists a rigid formulation that defines reconstruction and new construction, taking into account the cost of the measures and the method of financing. But here it must be clear that certain measures are carried within the framework of certification and streamlining—with simple, available funds. Let them be generally simple things, but the point of all this work consists in mobilizing internal resources at the enterprise.

Certification of work positions includes a comprehensive evaluation of each work position for the degree to which it corresponds to normative requirements and advanced practice in three areas:

the technical-technological level of the work position;

the organizational-economic level;

the conditions for labor and technical safety in the work position.

From the results of the evaluation one determines the work positions which meet the established requirements (the given work positions are considered certified); the work positions where these parameters can be reached after the corresponding streamlining and modernizing; superfluous work positions (unloaded) and work positions for which modernization is ineffective. Then one develops decisions concerning the reduction, streamlining, loading or continuation of the operation of the work position; the direction is determined and the time periods for streamlining are established.

The streamlining of work positions includes the development of concrete organizational and technical measures directed toward implementing the decisions that have been made and including them in the corresponding sections of the organizational and technical plan for the enterprises and also the implementation of measures that have been developed.

[Question] If one were to sum up what has been said....

[Answer] ...If one were to sum up what has been said, certification could be compared with a general housecleaning. Both now and in the future this is a campaign, but it is repeated from year to year in order to obtain an objective picture of the utilization of equipment and labor resources and the state of affairs at the enterprise, and to give it a one-time evaluation on the basis of which one can earmark concrete measures for the year for overcoming negative tendencies. A year later everything is repeated. And since certification and streamlining of work positions from the very beginning presuppose bringing them in line with the requirements for scientific organization of labor, our center has become the head organization in the country for conducting this work.

In various "corners" of our national economy today we have accumulated a good deal of unused, outdated "property"--space, equipment, fittings and so forth. And it is necessary to take a critical look at all of this, to resolutely get rid of unnecessary "junk," and to update some things and put them to work again. According to the calculations of I. A. Malmygin (PLANOVYE KHOZYAYSTVO No 12, 1985, p 104) just the elimination of superfluous work positions (without taking into account the effect from streamlining) and the organization of two-shift work on the progressive equipment that remains will make it possible to release 100 million square meters of production space and 500,000 repair workers and adjusters who are engaged in servicing old technical equipment, and to turn in about 500,000 tons of metal for remelting. This would indeed be a general housecleaning.

[Question] What are the basic directions for the work for certification and streamlining of work positions? What economic problems does this entail?

[Answer] The work for certification and streamlining solves two basic problems. First--the disclosure of superfluous, ineffectively utilized work positions and their elimination. Initially it is necessary to figure out one's economy and say what is superfluous, unnecessary and outdated. The second task is streamlining, bringing the work positions which remain up to the modern level. The concept of streamlining thus introduces nothing new. Its measures are the same as they were before, both organizational and technical. But streamlining provides a systematic approach to their implementation.

What does the first task involve and how did it arise? It arose because of the clear imbalance between the production apparatus and labor resources. In recent years there has been a good deal of discussion about the reasons for the personnel shortage. In the press, both scientific and popular, the most varied points of view have been expressed. The first version consists in that

the reason is basically a demographic one: the second postwar demographic "wave" has reached working age and it was small in number because of the consequences of the war. The second, more popular viewpoint is that the shortage of labor resources came about as a result of the low level of labor productivity in the country's industry. Hence the conviction that by essentially increasing labor productivity we will eliminate the personnel shortage. Each of these viewpoints, of course, has the right to exist. But neither of them, in our opinion, can explain the main thing. Twenty years ago, for example, our labor productivity is half of what it is now, but there was no shortage. Finally, the third viewpoint consists in that it is all a matter of the inadequate level of planning, that the total planned number of personnel at enterprises of the country exceeds available labor resources by several million people.

It took several years for the following point of view to win out among economists and economic managers: the main reason for the shortage is the lack of correspondence between the constantly growing number of work positions and the available labor force. Herein lies the basic reason for the shortage, and all the other factors merely aggravate it. Out of inertia we have continued to increase our production apparatus extensively, we have constructed new facilities, and we have filled them with new equipment. And then "suddenly" we saw that the labor force is not entering the national economy on such a large scale as it had before and as is necessary. In the press figures were repeatedly given which characterize this disproportion. According to data of a selective investigation of the USSR Central Statistical Administration, in November 1984 in machine building even on the first shift 14 percent of the work positions were vacant.

What does this lead to? First, the coefficient of shift work drops and, consequently, also the output-capital ratio. I recall extensive discussions about how to increase the coefficient of shift work. The ministries have given assignments to the enterprises and then they took on the corresponding socialist commitments. But the question, as a rule, has been reduced only to increasing the material incentives of the workers, providing them with transportation during the evening, and so forth. If one were to seriously look into the reasons for the decline of the coefficient of shift work it would become clear that such measures are quite inadequate and to place hopes in them means not to take into account the real state of affairs.

[Question] As we know, a fairly long period has passed since the adoption of the decree of the party Central Committee concerning the experience of the Dnepropetrovsk Combine Plant. What has been done in the country to disseminate the practice of certification during this time? What organizational steps have been taken?

[Answer] Even before the decree of the party Central Committee a decree was adopted by the USSR State Committee for Labor and Social Problems, the USSR Ministry of Agricultural Machine Building and the USSR Ministry of the Automotive Industry concerning dissemination of the experience of the Dnepropetrovsk workers. At the end of 1983 the USSR Council of Ministers and the AUCCIU adopted a decree concerning the development and increased effectiveness of collective forms of organization of labor. It also includes

points that make it incumbent upon management workers to conduct a certification of the work positions. In 1984 the all-union conference in Dnepropetrovsk whose organizers included the VNIMTsentr, became widely known. It adopted what I would call the fundamental recommendations which became the program of action for the ministries.

During 1984 the majority of ministries went through the preparatory stage for certification. They published the corresponding orders and plans, singled out the base enterprises, and appointed the head scientific research organizations for the development of branch methodological documents. Nonetheless the work for certification did not proceed actively enough.

The party Central Committee instructed the State Committee for Labor and Social Problems and the USSR ministries and departments to develop, in conjunction with the AVOCTU, proposals for planned introduction, beginning in 1985 on a unified methodological basis, certification and streamlining of work positions in industry and other branches of the national economy.

Thus 1985 was the first year when certification of work positions in industry actually assumed a mass nature.

[Question] And what was the VNIMTsentr doing during this time?

[Answer] A mass edition of temporary methodological recommendations was published.

[Question] Why temporary?

[Answer] You see, so far the approach to certification of work positions was too diverse and even varied. The USSR Ministry of Agricultural Machine Building had one approach while the automotive construction workers had another. But nonetheless we singled out what they had in common and what was necessary for all branches. These recommendations lay at the basis of practically all of the branch developments in 1984. And those enterprises which did not receive branch methods used ours completely.

We are working in close contact with the head branch institutes. In a year we give them more 900 consultation sessions. The influx of people desiring to receive consultation in the VNIMTsentr is the same as it was at the Dnepropetrovsk Combine Plant.

[Question] Yes, many specialists go there. But still, Aleksey Alekseyevich, there was probably more for you to do than you have done? I know that many workers in industrial enterprises who are engaged in certification complain about the lack of permanent methods and in general about the incomplete methodological development of these problems and the haste: there were not even temporary methods yet and still it was necessary to report on conducting certification at the enterprise. These complaints are addressed primarily, of course, to the USSR State Committee for Labor and Social Problems.

[Answer] Methods alone are not enough to remove all the problems that arise during the course of certification. Therefore we are working on a whole

series of documents. Our first task is to transform the temporary recommendations for certification and streamlining of work positions, taking into account the experience and critical remarks that have been accumulated, into a permanent fundamental document. Then we must provide the enterprises with a complex of normative documents which are necessary for conducting the certification. The preliminary information about the existing normatives for the organization of labor shows that not everything is in order here.

Today, for example, there exists an immense series of normatives on labor safety, but few normatives which make it possible to evaluate the level of labor organization. There are "blank spots" among the normatives that evaluate the technical side of production, but at the same time other normatives duplicate one another. Our task is to make a unified list of them, to revise that which requires revision, and to turn this task over to the branches because in the methods, in addition to a series of state standards and other fundamental documents of an interbranch nature, the specific features of the branches must also be represented. And this is gleaned better from branch documents.

It is thought, and it really is the case, that the main agency in the work for certifying the work positions in the country is the USSR State Committee for Labor and Social Problems. But certification is a link in the chain of "accounting-certification-planning of the number of work positions." Only thus can one arrive at a solution to the task that is discussed in the party document--providing for balance between the work positions and the labor resources. If one considers this chain in its various parts, questions of accounting are in the domain of the Central Statistical Administration, planning--the Gosplan, and evaluation of the technical level--the Gostandart. It turns out that certification of the work positions is the business of several departments. It was envisioned that each of them would create their provisions concerning certification. Additionally, scientific organizations of Gosplan and its divisions have been working for several years on methods for planning work positions at all levels. There are a number of unsolved problems here as well. They are associated primarily with the fact that there are several GOST definitions of what a work position is.

[Question] Here is what would be interesting to hear from your lips, Aleksey Alekseyevich. Frequently one hears at enterprises that various departments engaging in certification have not yet agreed on what a work position is....

[Answer] That is right. There are two GOST's with two different formulations, there is a third in the methods of the Gosplan, and a fourth in our temporary methodological recommendations concerning certification of work positions. But all of them differ only in detail. Their basic meaning is all the same: a work position is a production zone equipped with the necessary means of labor for highly effective work. In my opinion, this formulation is one-sided. It was correct when there were more workers than work positions. Today the situation is the exact opposite: there are more work positions than workers. This is the complex of implements and means of labor which requires the presence of a working person to go into operation. Now, for example, one-third of our motor vehicles do not leave the line. It is not very important to the national economy that there is a certain quantity of means of

transportation equipped with everything necessary for effective work of the driver; it is much more important that in order to put them to work it is necessary to have a certain number of drivers. The work positions is a complex whose normal functioning requires both the material side and the human side. So far, unfortunately, we have not managed to register this idea in normative documents.

[Question] What else is complicating the work on organizing the certification of work positions and developing scientific recommendations in this area?

[Answer] Actually, the range of issues that need to be resolved is fairly large. I shall discuss only a couple of them. It is easier to arrange accounting and conduct the certification in places where there is equipment, but it is necessary to learn to take into account work positions in places where there is no equipment as well. Many methods suggest accounting for these work positions through the labor-intensiveness and labor productivity and using as a "point of reading" these indicators and not the existence of equipment. This is what was done, in particular, in the well-known Leningrad method. Work positions which do not have equipment are accounted for in it as follows: the labor-intensiveness is related to the fulfillment of the plan and it turns out that the number of work positions is ideally equal to the number of workers.... This approach, incidentally, was used for the complete accounting of work positions in 11 machine-building ministries and 1984 in keeping with the instruction of the state committee for labor and social problems and the USSR Central Statistical Administration. It shows that the number of workers was 30 percent less than the number of work positions. We divide the one by the other and we obtain the current coefficient of shift work. It would appear that the certification has been reduced to nothing.

[Question] But guided even by simple daily observations we all understand that this is not the case....

[Answer] Of course not! Now 40 percent of the workers are employed in manual labor and 20 percent of the rest of them are working with mechanized instruments, that is, not with equipment. And yet frequently at an enterprise that is not staffed with personnel they open up a large building or start up a new conveyor line at which they cannot fill the work positions. You can probably already imagine the difficulty of accounting for the work positions. It is difficult, for example, to determine the need for work positions for the shop. We count the work positions for the basic workers with the equipment, and then it necessary to imagine how many work positions are necessary for assembly workers (here one actually can use normatives as well, and not simply count the sitters' benches). Certain categories of work positions must be counted according to the posts—lifters and crane operators, for example. This actually is complicated work in keeping with which it is necessary to classify all kinds of work, not even according to the branches, but according to the character of the technology and the technological peculiarities. And all this must be represented in the methodological recommendations.

[Question] Now, Aleksey Alekseyevich, I think that the EKO readers have evaluated the complexity of all this both from your discussion and, the main

thing, from the difficulties they encounter in real life. But these are, as it were, content difficulties. We should like to hear about organizational difficulties in greater detail.

[Answer] The country's central departments (State Committee for Labor and Social Problems, Gosplan, AVOCTU, State Committee for Science and Technology, Gosstroy, Gostandart and Central Statistical Administration) are now developing standard provisions for accounting, certifying, streamlining and planning work positions. Although this work has not yet been completed.

[Question] But the enterprises receive methods: different ones from the Central Statistical Administration, the State Committee for Labor and Social Problems, from the Gostandart and also the Gosplan, although they would appear to be coordinated they are separate. And each has its own report.... What do you yourself think, Aleksey Alekseyevich?

[Answer] I am in favor of one methodological document and let the branch documents "grow" out of it. Moreover, it is necessary to have one normative legislative document concerning the policy for conducting this work. In my opinion, it should reflect the functions of various departments, ministries and enterprises, the rights, responsibility and connection between the system of planning and technical progress, the organization of labor and accountability. It is necessary to systematize what already exists and create a complex of documentation of an organizational, administrative and legal nature.

[Question] And within whose competence does this fall?

[Answer] The USSR State Committee for Labor and Social Problems, the USSR Gosplan, the USSR Gostandart, and the USSR Central Statistical Administration.

[Question] But now, as I understood it, the work is proceeding in parallel to an unacceptably great extent?

[Answer] I wish to emphasize the importance of the saying, "The eyes are afraid but the hands do the work." No shortcoming or lack of scientific recommendations, normative documents or unsolved organizational problems can halt this work. In Dnepropetrovsk they already did it without waiting for scientific recommendations! There are people who are interested in it and they will use any evaluations, right down to intuition based on what the enterprises needs....

[Question] Let us talk about motivation. Aleksey Aleksandrovich Pokusa, the director of the Dnepropetrovsk Combine Plant and the initiator and strict adherent of certification did not have it. Moreover, one of the reasons for his heart attack was the "serious conversation" in the ministry regarding certification. But anyway motivation is the most powerful stimulus for development. How is this taken into account in the organization of certification?

[Answer] This question is largely one of the problems of improving the economic mechanism. Managers will be motivated when the role of the indicator

of output-capital ratio is increased. If incentives are given for the utilization of live labor today, even if not in the most perfect way, there will be no incentive for the utilization of fixed capital whatsoever. In this connection certain workers of the Gosplan, for example, suggest increasing the incentives of managers of the enterprises to do work for certification of the work positions, on the one hand, and to register in legislation the necessity for 100 percent loading of machine tools. Then, they say, the managers of enterprises will be forced to get rid of surplus equipment. But we are not so certain. There are three "tiers" in the solution to this problem. The upper one is the overall qualitative change in the economic mechanism. The middle one is composed of the partial decisions at the state level that are linked to accounting for the utilization of production capacities, the dynamics of the output-capital ratio, the formation of the economic and material incentive funds and development. And the lower level is incentives within the framework of today's conditions. But today the ministries are not interested in revealing their reserve, about which your magazine has written repeatedly. This lack of interest proceeds along the vertical right down to the shops: the shop chief also keeps his own reserves. The ministries have sufficient funds to provide incentives for the managers of enterprises to utilize equipment better by using the funds for new equipment, the material incentive fund (for example, awarding bonuses for performing especially important assignments), and so forth.

[Question] There is a great deal of space for action: from general improvement of the economic mechanism to the adoption of particular decisions.

Now the next group of questions. We should like to speak about the depth of the certification. It would seem that the certification of work positions should be a unit in the organization of production. How is it linked to the organization of production?

[Answer] When a work position is certified one must take into account its load, that is, its utilization in the technological process: to what extent is it necessary today and to what extent will it be needed in the future. Our methods envision such operations: to load a work position completely or, conversely, to eliminate it, and those few operations which are performed at it, say, on a half shift, to transfer to other work positions.

[Question] You mean that your methods take into account the existence of analogous work positions in the section?

[Answer] Yes, but there are fine points here. The words are the same, but they carry different meanings. When we certify work position we analyze only it. Still we consider all questions from the standpoint of this work position, even the load and the redistribution of the work. And when we are certifying a section or shop we even begin to consider the problems from these positions--of the section or the shop. And then we will certify the work of the system of service, planning and so forth. In the methods for certification we have now gone somewhat beyond the formal limits of the work position and are looking at whether or not it can be brought into the system of collective forms of labor organization and what the condition of norm setting in the given work position. Although it is clear that these questions

must be evaluated when certifying a shop, for example. For the norms are not attached to the work position, and the questions of loading also go beyond its limits. But these and similar problems will be completely resolved when the sections and shops are certified.

[Question] Does this mean that the connection between certification work and the production section is a matter of the future?

[Answer] Yes. There are now proposals to take certification beyond the limits of the work position and there is even experience at certain enterprises where technological enterprises, sections and shops are being certified. In the final analysis it is even possible to certify enterprises so as to have the possibility of determining the production program correctly.

But what does it mean to certify a shop? Sometimes it must be a series of individual certifications—of equipment, technological processes and the level of organization and sometimes it must be a unified certification.... When we speak about certifying work positions we have in mind an analysis of the organizational, economic and technological aspects. Of course this is not easy. But under the conditions of the sections and shops all this becomes complicated even more. And what about certifying brigades? This is an extremely complicated process, especially with such a diversity of principles for constructing brigades as we have. Leningrad workers, for example, have seven types of them.

[Question] Aleksey Alekseyevich, in your method how are branch peculiarities taken into account?

[Answer] You know, I think the significance of these so-called branch peculiarities is exaggerated. There are peculiarities that are dictated not by the branch, but the peculiarities of the production process. To me as the organizer of this work it makes no difference in which branch the continuous process is taking place—in ferrous metallurgy or the food industry. But here it is necessary to be guided by a sense of measure: to enter into someone else's area means to impose something on others. And not to take peculiarities into account means to make the method academic.

[Question] As practice shows, the basic production losses come at the junctures between work positions. What steps do your methods envision for overcoming these losses?

[Answer] This is indeed true. These losses are manifested in the work position. But the study of losses and the investigation of disproportions in production will be complete only when we certify sections or shops as a whole.

[Question] And how does one determine whether or not a certification has been conducted objectively?

[Answer] According to the expert evaluation of specialists, the proportion of work positions that fully meet modern requirements is in the range of 10-25 percent, depending on the kind of production, the specific features of the branch, the age of the enterprise and other peculiarities.

But the objectiveness of the evaluation is indeed one of the most complicated issues. For if the economic manager thinks that there is no advantage for him to have a "general housecleaning" he will, figuratively speaking, sweep the garbage under the rug and report that everything is in order. Therefore the results of the certification must be judged according to the final economic indicators. One cannot establish assignments for enterprises directly, from above, according to the achievement of the "percentage" of certified work positions. In my opinion, the results of certification are reflected well by such an indicator as the number of work positions that are eliminated. Now let us compare. In recent years about 2 percent of the fixed capital has annually been removed from production, and this has been without any kind of certification. At the leading enterprises—the Dnepropetrovsk Combine Plant, the Dneprovsk Machine-Building Plant, and the Minsk Tractor Plant—from the results of the certification 7-9 percent was eliminated, that is, hundreds of work positions. But there are enterprises which are reduced by literally two-three work positions. If from the results of 1984 at enterprises of the Ministry of Agricultural Machine Building 5.6 percent of the work positions were eliminated, in the Ministry of Machine Building for Animal Husbandry and Fodder Production it was—0.9 percent, the Ministry of Power Machine Building—0.8 percent and the Ministry of Chemical and Petroleum Machine Building—0.6 percent. I do not think that there is any need to comment on these figures.

It should be admitted, however, that we are also guilty of a liberal approach to certification. The temporary methodological recommendations for certifying and streamlining work positions allowed for the certification of work positions which have certain deviations from the established requirements. As a result, at the enterprises there was a large category of "partially," "conditionally," "temporarily," and so forth certified work positions, and as a result, all of them ended to be "simply" certified.

[Question] And, finally, the last question. From which enterprises can you recommend the experience in certification and streamlining of work positions to our readers?

[Answer] This work has been arranged really well at the Dnepropetrovsk Combine Plant and at enterprises of the Ministry of Agricultural Machine Building in Moscow and Tashkent. Automotive construction workers have a large amount of good experience, and not only in automotive construction as such, but also in the bearing industry. At enterprises of Estonia that are basically under republic jurisdiction there is also something to learn. This work has been arranged well at ZIL. This is now perhaps the only large association that has retained its uniqueness in its approach to certification.

As you have probably understood, the work for certification is continuing. We have already done a certain amount, but there is still a great deal to do.

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BALANCE OF PRODUCTION RESOURCES STRESSED

Novosibirsk *EKONOMIKA I ORGANIZATSIYA PROMYSHLENNOGO PROIZVODSTVA* (ENO) in Russian No 4, Apr 86 pp 112-121

[Article by R. N. Tikidzhiyev, candidate of technical sciences, chief of the division for effectiveness of capital investments and fixed capital of the TsENII under the RSFSR Gosplan (Moscow): "Work Positions, Labor Resources and Capital Investments"]

[Text] Measures are being taken in the country's national economy to eliminate the imbalance between the existing and created work positions on the one hand and the labor resources on the other. But there are weak and inadequate areas in the solution to this problem.

The Quantitative and the Qualitative Imbalance

Analysis shows that in RSFSR industry in 1983 every sixth work position created during the 10th Five-Year Plan at new and expanded enterprises and every third work position at reconstructed enterprises was vacant. Moreover, the staffing of newly introduced enterprises with personnel frequently took place at the expense of reducing the number of industrial production personnel at existing enterprises, where processes of technical reequipment are lacking or are retarded, and inadequate attention is paid to improving the conditions for the labor and life of the workers.

The situation is not changing for the better so far. Moreover, difficulties with staffing new enterprises are increasing. The situation is especially poor at new enterprises introduced in 1976-1980. In the USSR Ministry of Chemical Machine Building, the USSR Ministry of the Electric Equipment Industry, the RSFSR Ministry of Light Industry, the RSFSR Ministry of the Food Industry and at facilities of the USSR Ministry of the Automotive Industry, the RSFSR Ministry of the Industrial Construction Materials Industry and the RSFSR Ministry of the Textile Industry which were introduced during those same years. This is mainly because during those years there was an increased proportion of enterprises that had not assimilated their planned capacities. Thus in the RSFSR Ministry of Light Industry the increase was from 50 percent in 1980 to 63.9 percent in 1982; in the RSFSR Ministry of the Industrial Construction Materials Industry--from 54.5 to 79.3 percent; in the RSFSR Ministry of the Textile Industry--from 53.3 to 84.3 percent. An analogous

tendency can be seen in other branches of industry as well. As a result, in 1982 the level of output-capital ratio at newly introduced, expanded and reconstructed enterprises and facilities in RSFSR industry during 1976-1980 was 13.1 percent lower than the planned level, and in 1981-1982—23.2 percent lower.

There was no qualitative correspondence between the level of training of personnel and the work positions either. Because of the shortage of skilled personnel, especially at newly introduced enterprises, the assimilation of the projected indicators is delayed for many years. Thus in 1982 in RSFSR industry the output-capital ratio decreased by 13.4 percent because of this, and during 2 years of the 11th Five-Year Plan at new enterprises—by 28 percent.

The Branch and the Territorial Problem

The work for creating a balance between work positions and the number of workers was started in the production associations (enterprises), that is, in the places where the shortage of labor force actually appeared. Experience confirms the importance and the prospects of this work at the low level of production management. But in order to carry it out successfully in the country as a whole one cannot be limited simply to this level or even to the level of the ministries and departments.

It is impossible to achieve balance between work positions and labor resources without observing the necessary proportions in the development of the branches of the national economy. At the national economic and republic levels we are providing for improvement of a number of territorial proportions that encompass the development of large regions (the East, the West, the Northern Zone and so forth) as well as the creation of interbranch productions and agroindustrial and territorial production complexes.

The balance between work positions and labor resources can be proved significantly as a result of improving the territorial management in industrial production, in construction and in other branches of the national economy on the basis of combining branch and territorial planning.

Grimaces of Reconstruction

In keeping with the approach formulated at the conference in the CPSU Central Committee regarding questions of accelerating scientific and technical progress, it is suggested that capital investments be made primarily in reconstruction and technical reequipping. This will contribute to providing for balance between existing and newly created work positions, on the one hand, and existing labor resources, on the other. Because of technical reequipping and reconstruction of enterprises the number of work positions will decrease and thus labor force will be released to fill second and third shifts, and also to be used at expanded and newly introduced enterprises. But so far when plans are being formed for capital investments the ministries are not fully taking into account the requirement for allotting them mainly for technical reequipping and reconstruction. New work positions are being introduced without taking into account the already existing and available

number of workers and without analyzing the possible and required volume of modernization and reduction of existing work positions. They do not observe the necessary ratio between new construction, expansion of enterprises and reconstruction with technical reequipment. Moreover, under the 11th Five-Year Plan the situation became even worse than under the 10th. Thus in the USSR Ministry of the Machine Tool and Tool-Building Industry during 1976-1980 it was intended to construct a new enterprise in Ryazan Oblast and at the same time to expand the existing one. As a result, the new one was staffed with personnel by 55.3 percent in 1981 and 55.2 percent in 1982 while the figures for the one that was expanded were 64.4 and 66.9 percent, respectively. Under the 11th Five-Year Plan the personnel situation was not taken into account when they envisioned the expansion of enterprises of the USSR Ministry of the Chemical Industry in Omsk, Kuybyshev and a number of other oblasts and autonomous republics.

Analysis shows that in all large economic regions with the exception of the North the reconstruction of enterprises during the years of the 10th Five-Year Plan was accompanied by an increase in the number of workers at them: from 101.1 percent in the Volgo-Vyatka region to 180.5 percent in the Northwest.

How To Coordinate Interests

The figures that have been presented show that the mechanism existing in the oblasts, krais and autonomous union republics for balancing with the ministries the increase in the number of workers is "spinning its wheels." The main reason is its inadequate orientation toward internal reserves: raising the technical-economic and organizational level of production and releasing and redistributing workers in the interests of developing new productions and completely staffing existing enterprises. The majority of territorial and administrative units maintain a policy whereby only those enterprises where an increase in the number of workers is envisioned are obliged in the stage of drawing up the draft of the plan to coordinate it with the committees and divisions for labor and the planning commissions of the ASSR Council of Ministers or the obl(kray)ispolkoms. Moreover, the increase in the number of workers should be based on the rates of increase of the production volumes and labor productivity and figures that characterize the utilization of the basic technological equipment, the assimilation of capacities, shift work, the proportion of manual labor, labor turnover, losses of working time, the distribution of brigade and other progressive forms of organization and payment for labor, and the introduction of measures for scientific organization of labor. For productions that are being newly introduced one takes into account the number of personnel and the labor productivity envisioned by the plan, taking into account the planned deadlines for the startup and normative assimilation of production capacities. With the help of these indicators one can analyze the utilization of personnel and the level of loading of equipment as well as reveal reserves for increasing labor productivity, reducing the number of workers and releasing them.

A large part of the enterprises and organizations are not subjected to this kind of analysis since the number of workers there is not increasing. For these the limits on the number of workers are established automatically, without taking into account all the reserves for the utilization of the labor

force, the existing potential of the capacities, fixed capital or increased labor productivity. The influence of the planning agencies on the results of the utilization of labor resources should be more complete. To achieve this it is necessary for the planning agencies to analyze the condition of the utilization of the labor force at all enterprises and, taking this analysis into account, coordinate the number of workers with their managers. This is the way the Moscow, Leningrad and Chelyabinsk Oblast planning commissions operate.

The establishment of limits that are oriented toward reducing the number of workers and employees is a central part of the provision of balance between labor resources and the demand for them.

Conventional Release—A Reality or a Mirage?

The weakness of the existing mechanism for coordinating with the ministries the increase in the number of personnel consists in that it is based on the indicator of conventional release of personnel. But this certainly does not mean that conventional release is equal to absolute release and will contribute to filling vacant positions in one or another. Since as a result of conventional release of personnel, as a rule, one does not provide for a complete staffing of enterprises with personnel, the plan of measures for increasing labor productivity and raising the technical and organizational level of production, in the final analysis, does not correspond to the real demands of production.

Changes are needed in the planning of the release of personnel. First of all, in the balance calculations of the additional demand for labor force of the enterprises and organizations it is necessary to introduce the indicator of the absolute release (reduction of personnel). It should also be singled out in the balance calculations of the additional demand for skilled workers and specialists (according to the sources of their provision), envisioning the amounts of professional retraining and increased qualifications of the workers who are released.

Closely linked to the planning balances of the movement of positions and workers should be the distribution of youth for training and work; the volumes of training of workers in vocational and technical school; the assignments for labor placement of the population, particularly for redistribution of youth and population throughout the territory of the oblast; and plans for staffing startup facilities with industrial production personnel.

What Do Statistical Reports Provide?

There are now no statistical reports that make it possible to compare the number of existing and newly created work positions with the number of workers. In 11 branches of machine building this has become possible because of reports that were temporarily introduced in 1984.

Most frequently, in order to analyze the aforementioned ratio on the scale of the national economy and its individual branches, one uses the indicators of

the planned and actual average listed number of industrial production personnel (Form No 9 in industry, No 3t--in construction, and so forth). According to data of the RSFSR Central Statistical Administration, in 1982 in the RSFSR National Economy the actual number of workers and employees was less than the planned number determined according to the sum of plan-limits of the enterprises, institutions and organizations by only 2.3 percent. Although this method of analysis provides for encompassing all enterprises, institutions and organizations, the result that is obtained is clearly imprecise. Frequently the planned number of personnel is established on the basis of the level achieved and is decreased as compared to the planned level, and also as compared to the level calculated taking into account the normatives for the assimilation of planned capacities. This orientation in planning and normative documents toward incomplete staffing with personnel artificially covers up the imbalance between fixed capital and labor resources.

In our opinion, in order to characterize the balance of fixed capital with the number of workers one can use indicators of the staffing at new, expanded and reconstructed enterprises and facilities that have been put into operation in various branches of industry (Form 1 GP). This also gives information about staffing enterprises in oblasts, krais and autonomous republics of the country. Of course, this form does not encompass the existing enterprises, including those that have been subjected to technical reequipping. But it makes it possible to reveal the influence of the level of staffing with personnel on the amounts of output of the gross product, on the indicators of the output-capital ratio, labor productivity and so forth.

The Need to Introduce Incentive Levers

The effectiveness of the mechanism for controlling the balance between work positions and labor resources will increase if the indicator and the number of work positions is introduced into the reports and planning. Then the work position will be the link between the reproduced production capacities, fixed capital and labor resources. This role should be maintained and supported by capital investments. This policy has already been put into practice. Thus in Shchekino, by a decision of the oblast party committee and the USSR State Committee for Labor and Social Problems, a comprehensive system of control of labor resources is being introduced. The TsENII under the RSFSR Gosplan also participated in drawing up the plan for the 12th Five-Year Plan. One of the main points of this plan is the balance among labor resources, work positions and capital investments.

What are the most important conditions for planning capital investments in order to achieve a balance between work positions and labor resources.

Under the conditions of the limitation on the number of workers and capital investments, the planned increase in output can be provided through two factors: improvement, replacement and reduction of existing work positions by directing capital investments primarily toward raising the technical level of production; the creation of additional work positions in order to satisfy the need for products and services which cannot be provided with the existing production. But the creation of additional work positions cannot be allowed

unless there is an absolute release of personnel with the higher technical level of production and if conditions are not created for transferring and assigning released workers to regions with new construction.

One can suggest this policy. The ministries and departments, in keeping with the assignments for increasing the output of products and the limits on the numbers of personnel and capital investments, draw up balances of existing, modernized and created work positions and number of workers in the branch as a whole and in the territorial cross-section, singling out those oblasts, krais and ASSR's where enterprises of the branch are located and are developing. These balances are drawn up on the basis of a comparative analysis of the number of work positions and the number of workers, taking into account measures for raising the technical and organizational level of production, technical reequipment and reconstruction of existing production, and improvement of the reproductive structure of capital investments.

But if certain ministries do not provide for fully staffing the existing enterprises and do not have a sufficient reserve of personnel for new and expanded enterprises, they should limit the allotment of capital investments for the creation of new work positions. In these cases the funds can be allotted mainly for technical reequipment of production and reconstruction in order to eliminate the existing shortage of personnel. As a criterion for limiting the allotted capital investments or changing their reproductive structure one can use the reduction of the indicator of shift work of equipment as compared to the established level. The expediency of introducing this incentive is confirmed by existing experience in controlling the balance of work positions with labor resources in Czechoslovakia.

The mechanism created here includes three elements:

In the oblasts and ministries they draw up balances of labor resources in order to reveal their increase, to coordinate them with the needs of the national economy and to train personnel with the necessary occupations and skills. The need for training the necessary personnel is determined on the basis of notifications from enterprises concerning possible work positions. The ministries send the total order to the Ministry of Labor and the Ministry of Education. It sends the information to the corresponding schools and other training institutions. Thus they provide for the necessary orientation both of the students (they are notified of the existing work positions) and of the management of the enterprises (after obtaining the corresponding agreement of the students).

With this procedure it is possible to satisfy 80-90 percent of the need for personnel in each ministry. But if the ministry has failed to take something into account and has fallen behind in training particular personnel, the schools and other training institutions have reorientation and ways of making up for the shortage of personnel for this branch.

The second element is based on the territorial-branch policy for distributing labor force. Even in the stage of determination of the control figures each ministry must adjust and balance its plans with respect to enlisting labor force for individual branches with the Gosplan. After the approval of the

plans they are refined and the increase in the labor force of the associations is coordinated with the local planning agencies. If they do not reach an agreement the association sends its ideas to the ministry, and the local planning agencies--to the Gosplan. At this level they coordinate the number of work positions and the number of personnel. Then the indicators are sent in the form of final proposals to the lower units for guidance.

The third element envisions the establishment of a dependency between the allotment and utilization of capital investments and the condition of the utilization of the existing potential of the capacities. In order to expand all branches (with the exception of extracting branches) a limit has been established if the coefficient of shift work of equipment is less than 1.5. The fund for the development of production also decreases. In all stages of the substantiation of the expansion of production or construction of new (development of planning documentation, completion of construction, assimilation of planning indicators) the provision of labor forces is regarded as the most important condition.

In order to increase the effectiveness of the mechanism created in our country for controlling the balance between work positions and labor resources, it is expedient to add to these elements incentives for the utilization of the existing potential of fixed capital, capacities and equipment.

Now the main work for ensuring balance between work positions and labor resources is taking place at the level of production associations (enterprises), and it has not yet been properly developed at the level of ministries and departments in the national economy as a whole. While in industry the problem is being solved on a fairly broad front, in other branches of the national economy everything is essentially just beginning. These arrears make it difficult to solve this problem at the level of the oblasts, krays and ASSR's.

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ZIL SOLVES LABOR RESOURCE PROBLEM

Novosibirsk *EKONOMIKA I ORGANIZATSIYA PROMYSHLENNOGO PROIZVOODSTVA* (EKO) in Russian No 4, Apr 86 pp 121-128

[Article by A. P. Glazunov, deputy chief of the territorial administration of the Production Association Zavod imeni I.A. Likhachev (Moscow): "Certification at ZIL"]

[Text] Specific Features of the Association

The production association Zavod imeni I. A. Likhachev consists of a main plant in Moscow and 17 specialized branch plants. Their geography is fairly broad: from Zhitomir in the West to Chita in the East. We solve the problem of efficient utilization of labor resources in several directions. One of them is certification of the work positions.

How the Program of Certification Is Carried Out

The preparatory period for changing over to certification of work positions was fairly long. A general plant working group was created from specialists in various functional services in order to resolve the entire complex of issues in a competent way. This group was made responsible for the development of methodological aids, forms of passports and other documentation. The passports and methods were approved in two shops of the head plant. After this the necessary changes were made in them. The work for passportization and certification of the work positions was handled by the engineering-technical and economic services of the plant.

During the second half of 1981 we changed over to mass transportization and certification of work positions under the leadership of the general plant commission. The commission was headed by the deputy director for economics. It was constantly hearing reports from managers of structural subdivisions concerning the course of the passportization and certification of the work positions and solving organizational and methodological problems related to the loading of equipment and the employment of workers in the cycle and shift and also questions of the establishment of wage rates; it clarified the benefits to compensate for work with harmful working conditions, and so forth. Analogous certification commissions were created in all the structural subdivisions of the association and in the branches.

We determined the necessary number of people in each work position taking into account the existing technological equipment and its handling capacity. The certification and passportization of the work positions was begun with an inspection of the technological and technical-norm charts, verifying that the condition of the work position corresponded to the technological documentation.

Seminars were conducted for managers of subdivisions and officials. With the help of the branch institute for increasing the qualifications of engineering and technical personnel we organized courses for increasing the qualifications of workers in norm setting for labor. These courses and seminars helped to develop unified views and methods of improving and norm setting as well as organizing labor on the basis of passports of work positions.

The division for norm setting for labor which is included in the structure for technological management, was made responsible for the development of methods and the preparation of materials for the general plant commission concerning questions of passportization and certification of positions in the association, and also organizational questions. We worked in close cooperation with the plant's economic services.

The passportization made it possible to determine the number of work positions, to calculate in a technically substantiated way the existing need for personnel in each work position, and to reveal unproductive losses of working time. It made it incumbent on engineering and technical personnel to speak out and analyze shortcomings in the organization of labor and to take measures to eliminate them.

The Passport of the Work Position

This is a standard document in which one does the technical and economic calculations that regulate the organization of the work position. It serves as a basis for determining the planned number of workers and is used for introducing collective forms of organization and payment for labor and solving other problems related to improving the organization and norm setting for the labor of workers. We have come to the conviction that no less than eight forms of passports are needed for our association. Each production should have its own passport. But the basic indicators for all categories of workers in all productions are the same.

What is the structure of the passport of the work position for the basic production worker? On the passport one can find the following information: a) general information concerning the given work position; b) the number and form of service of the work position; c) the system of wages; d) the program for the output of items (per month, per shift); e) the number of the operation and the number of the part; f) the model of equipment and the coefficient of its loading.

All these data are entered from the album of operational charts of the technological process and the album of capacities of equipment and technical-norm setting charts. The design of the work position is indicated here (the

route of the worker's movement during the cycle), the names of the developers, the responsible officials from the functional services, the chairman of the commission and the decision that has been adopted regarding this work position.

The main part of the passport contains the certification indicators for the work position. It is broken down into six sections.

The first section is the availability of technological documentation and its correspondence to the YeSTD; charts of the technological process; technical-norm-setting charts with a calculation of the time norms, flow charts, information about servicing numerous machine tools, and the design of the work position.

The second section includes the correspondence of the technical equipment, the technical and organizational fittings listed in the charts of the technological process to the actual situation in the work position.

The third section includes elements of working conditions and the amount of difficulty of the worker's labor throughout the shift and figures concerning the degree of mechanization of the work.

The fourth section includes the protection of labor. Entered in the passport are: instructions, special work clothing and means of individual protection.

The fifth section includes privileges for the working conditions in the work position (pension benefits, the duration of additional vacation for working conditions, the reduced working day, therapeutic-preventive nutrition, and so forth).

The sixth section includes the calculation of the technical and economic indicators.

As was already said, during certification attention was devoted not only to the level of technological process, but primarily to the loading of equipment and the employment of the worker. Therefore the sixth section includes the calculated amounts and the coefficient of the employment of the worker during the cycle and the shift; the calculated labor-intensiveness for the manufacture of a unit of the item and the labor-intensiveness used for payment; the rating per operation; the monthly wage taking into account the planned percentage of bonus. From these indicators one can deduce the planned number of personnel and they give a clear idea of the number of workers who are distributed among the various shifts depending on the working conditions.

When evaluating the condition of the work positions and their streamlining we strive to achieve optimal values of the basic certification indicators:

the coefficient of employment of the worker during the shift (permissible values within the range of 0.7-1.0);

the coefficient of loading of equipment (permissible values within the range of 0.65-0.95).

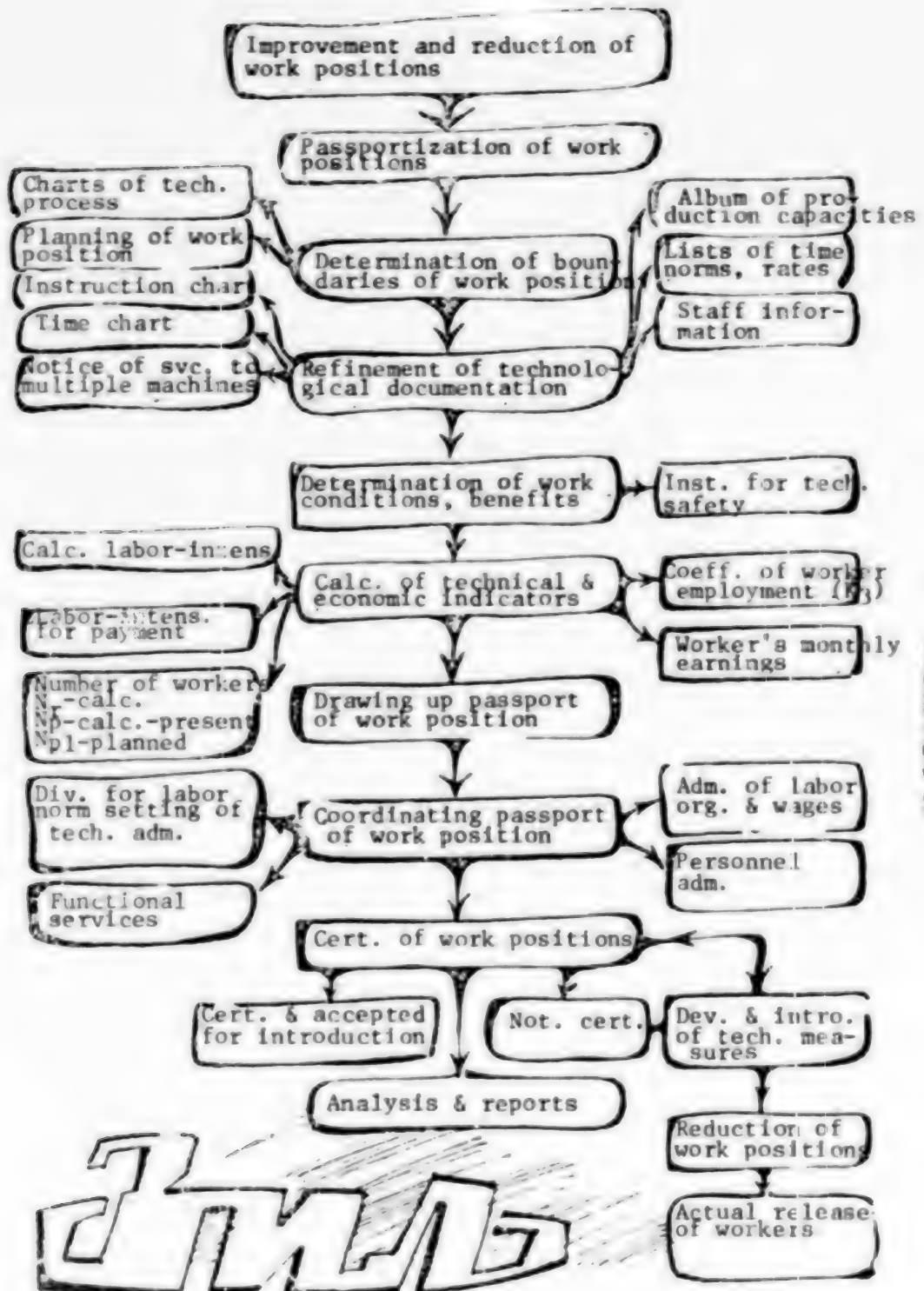


Diagram of Work Conducted in the Association for Improvement and Reduction of Work Positions

When establishing these evaluation indicators we were guided by the methodological and normative materials on the organization of labor and service for production which were developed by the USSR State Committee for Labor and Social Problems, the Scientific Research Institute of Labor, the Scientific Research Institute of the Automotive Industry and other scientific research organizations.

The passport of the work position of the basic and auxiliary workers is by the developers and coordinated in the functional services, and then it is submitted to the shop commission. The certified passport is reproduced in four copies and one copy each is sent to the technical section of the subdivision, the work position, the functional services of the association and the division for norm setting for the labor of technological management.

The existence of these passports has enabled engineering and technical personnel of the subdivision to take advantage of the possibilities that were revealed in the work positions for loading equipment and for increasing the employment of the worker in the cycle and the shift to the optimal values and provide better instruction for newly hired workers.

When a newcomer comes to work for us he becomes familiar with the passport data of the work position, that is, with the conditions in which he will be working and the benefits if they are envisioned for the given work position. He learns what his monthly wage will be under the condition of the fulfillment of the norm. And, which is important for production, he becomes familiar with the requirements which will be placed on him in servicing the work position.

If a work position is not being certified the commission makes it incumbent on the technical and economic services of the subdivision in conjunction with the shop foreman to develop organizational and technical measures directed toward achieving certain values of certification indicators. After their introduction the newly drawn up passport of the work position is sent to the commission. The work positions for which a low level of employment is typical are combined with other work positions or they are disbanded. We receive an economic effect from the work for certification as a result of better utilization of technical equipment and the release of workers.

Passportization has made it possible to determine the number of work positions and to calculate in a technically substantiated way the actually necessary number of workers in each work position as well as to reveal unproductive losses of working time. This has made it incumbent on engineering and technical personnel to seek out and analyze shortcomings in the organization of labor and to take measures to eliminate them.

As of 1 January 1985 95.6 percent of the work positions in the association were certified. Some of the work positions were not certified either because of the production being transferred from one subdivision to another or because of the assimilation of new kinds of products or changes in the technological processes. On the basis of our own experience we have come to the conclusion that the movement of production leads to a situation where each year 5-6 percent of the work positions at the enterprises cannot be certified.

In order to make the work for certification more effective and to motivate the collective to carry it out efficiently, beginning in January 1982 the basic evaluation indicator "Certification of Work Positions" was introduced into the conditions for the association's socialist competition.

During the time when the passportization and certification of the work positions was being conducted 1,113 people were released and an economic effect of more than 3 million rubles was obtained (from the wage fund). We are now improving the passports and changing over to processing them on computers. This will make it possible to obtain the necessary information more rapidly.

A Couple of Conclusions

The passportization proceeded on a high level in places where firm technological processes had been established and where there are progressive normatives for time and the number of workers. This pertains to work positions for workers in basic and auxiliary production: machine tool operators, fitters in machine assembly work, adjusters, controllers from the division for technical control, transport-warehouse workers and others. In the mechanics and energy services we have not yet received the desired result: the lack of progressive time normatives have had its effect.

In the initial period of the work for passportization it was necessary to overcome a certain "psychological barrier." As usual, everything that is new evokes doubts and one could see the effect of being accustomed to all the work methods and also the lack of experience and methodological recommendations, which we had to develop through our own forces. It sometimes happened that individual workers, in order to conceal existing reserves in the subdivisions, tried to draw up the passport for the work positions with an exaggerated level of employment of workers in the cycle and the shift. There were also mistakes which distorted the real state of affairs. But the engineering method of calculation made it possible to determine the optimal number of workers in each work position.

Certification and passportization have made it possible to find a number of responses to questions related to the organization of labor. Of course, all information gathered in the passports existed at the enterprise before, but in various sources, separately, which made it impossible to utilize it comprehensively. The passport has generalized all the information and made it possible, on the basis of technical and economic calculations, to utilize equipment better, to improve technological processes, to introduce scientific organization of labor more extensively (servicing more than one machine tool, combining occupations and so forth), and to correctly establish benefits and reduction of the work day for certain categories of workers, striving to achieve optimal values of evaluation coefficients (employment of the worker and loading of the equipment in the cycle and shift).

When establishing the number of workers for the planned period there sometimes arises a disagreement between the functional services and the divisions. When we have the passport we immediately translate the conversation into a concrete

vein. How many workers are you short? In precisely which work positions? The managers of the subdivisions and services have a real picture of the state of affairs in each subdivision. This facilitates planning within the association. Now when we receive planning assignments we begin with an analysis of whether or not the work position can handle an increased volume of production and whether it is necessary to change the working conditions or increase the number of work positions.

Certified passports for work positions for all categories of workers are periodically revised, when any changes are made in any one of the six certification indicators. Changes in the passport can be made for various reasons: because of changes in the technological equipment, the technical process, the volumes of production, the transfer of work positions from one section to another, and so forth. The passport registers all these changes and corresponds to the actual state of affairs in the work position.

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WORK OF INDUSTRIAL EFFECTIVENESS SEMINAR REPORTED

Novosibirsk *Ekonomika i Organizatsiya Promyshlennogo Proizvodstva* (EPO) in Russian No 4, Apr 86 pp 128-131

[Reports on speeches: "Opinions, Experience, Problems"]

[Text] An all-union seminar entitled "Experience in Increasing the Effectiveness of Production in Industry on the Basis of Certification and Streamlining of Work Positions" was held in Dnepropetrovsk. It was prepared by the USSR State Committee for Labor and Social Problems, the Dnepropetrovsk Obkom of the Communist Party of the Ukraine, the Ministry of Agricultural Machine Building, the UkrSSR State Committee for Labor and Social Problems, the All-Union Scientific-Method Center for Organization of Labor and Management of Production and the Dnepropetrovsk Combine Plant imeni K. Ye. Voroshilov. The materials of the seminar have been published in a separate edition.¹ We are offering summaries of certain statements by participants in the seminars for the reader's attention.

Without Fuss or Hurry!

From the materials of the paper by A. V. Glichev, doctor of economic sciences, director of the All-Union Scientific Research Institute of Standardization.

Labor productivity is increasing at those enterprises that are conducting comprehensive certification. In the brigades the increase amounts to 10-12 percent. At the Dnepropetrovsk Combine Plant there are brigades in which during a year and a half labor productivity has increased by 25 percent. This is an explosion. But how does one take advantage of it? Naturally, this should not lead to superficial solutions. When introducing this experience it is necessary to act quickly, but not in a hurry. It is necessary to recall the bitter experience with the introduction of comprehensive systems for product quality control when at first, wishing to report more quickly that the system had been created, many managers began to create standards for the enterprise without having even started the work for improving the organization of production. At a whole number of industrial enterprises the KSUKP was discredited because of a lack of preparation and excessive haste.

Such a danger also exists with the dissemination of the experience in certifying work positions. This must not be allowed.

Certification of the Work Position of the Foreman

From materials of the paper by I. Kh. Masin, general director of the Tashkentskiy Traktornyy Zavod imeni 50-Letiye SSSR Production Association.

In addition to certifying the work positions for the basic and auxiliary workers, the association has carried out work for certifying the work position of the foreman—the immediate manager of the primary production collective. A plan has been developed and approved for organizing the work position of the foreman, taking into account the experience of other enterprises and the suggestions of plant specialists. According to the plan, it will be a complex which includes an office with the appropriate supplies and a well-arranged space adjacent to it (15-20 square meters) which can be used for conducting brief meetings, longer meetings, and operations conferences with the collective of the section, and also for the workers to rest during their dinner break. The new work positions of the foremen, in keeping with the standard plan, have been organized in two machine assembly and automation shops. In the near future work positions of foremen will be organized and correspondingly certified in another 10 shops of the plant.

Certification of Technological Processes

From the materials of the paper by S. F. Kravchenko, candidate of technical sciences, deputy head engineer of the Dnepropetrovsk Machine Building Plant.

At the plant we have fully evaluated the great significance of the experience of the combine plant for individual and small-series productions. But with this type of production during the course of the shift both the content of the operations and the parts at one work position changed several times. And this requires a special approach and therefore special accounting for the technological process. The greatest effect is achieved when certifying work positions in precisely those places where the technology is also improved, that is, a number of outdated work positions are eliminated and new, more productive ones are introduced.

What is the essence of the certification of a technological process and what are its criteria? In the first place, it should be coordinated with the certification of the work positions and with the determination of their role in the technological process. There are hundreds of thousands of technological processes at an enterprise and if one takes on all of them, of course, the effect will be minimal and the losses will be very significant. Therefore it is necessary to certify technological processes which are in the "centers of expenditures" and will produce the greatest effect when improved. The designer, technologist, economist, and of course, the worker and the foreman participate in the certification of technological processes. All of them become authors of the technological process, which makes it possible to provide for maximum effectiveness of production. When we conducted the certification we discovered a whole number of problems. It turned out that

some of the technological processes simply did not exist and there was nothing to certify. The technologist whose basic task it was to increase the production of effectiveness spends only 30 percent of his working time planning technological processes and the rest of it is spent on other work. Therefore, measures were developed at the plant for increasing the role of technologists in the creation of progressive technological processes in all kinds of work without exception and for all sections of it.

Second, many documents at the level of state standards require a description of the technological process (even for a washer, a kerchief or other simple items) of 15-20 pages. As a rule, the worker today does not open up and does not read the description of the technological process for a simple part, but when manufacturing a complicated part it is very difficult for him to glean from the description what is most essential and important. Of course, it is necessary to revise the process of planning technology. Probably it would be too difficult to change much on the spot, at the enterprise. But nonetheless there are questions which can and should be resolved here. And the main direction was automation of planning of technological processes. Today in the Dneprovsk Machine-Building Plant every fourth technological process is planned by this method.

Thus within the framework of the system for control of production quality and effective utilization of resources which is under consideration the most important thing is a comprehensive approach embodied in the form of a standard which takes into account conducting work simultaneously in three areas: certification of work positions, certification of technological processes and certification of work performers. This standard has been developed by several enterprises in conjunction with the Gostandart and is now in the stage of introduction. And even the first results have shown that this approach is the most effective and correct, and it promises the greatest advantages.

FOOTNOTE

1. "Opyt povysheniya effektivnosti proizvodstva v promyshlennosti na osnove attestatsii i ratsionalizatsii rabochikh mest" [Experiment in Increasing the Effectiveness of Production in Industry on the Basis of Certification and Streamlining of Work Positions], Moscow, 1984.

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PRODUCTION MANAGER'S WORK DAY DESCRIBED

Novosibirsk *Ekonomika i Organizatsiya Promyshlennogo Proizvodstva* (END) in Russian No 4, Apr 86 pp 134-144

[Article by R. K. Yuksvyarav, doctor of economic sciences, professor, Tallinn Polytechnical Institute: "The Work Day of the Manager: Wishes and Reality"]

[Text] Consultants who study problems of management of enterprises frequently ask themselves the question: Why do the managers not follow their recommendations for improving management activity and act just as they did 10 years ago? And even the proposals themselves have varied. "Moderate" advisors have given individual recommendations on how to improve the management and "extremists" have gone further—they have suggested strict prescriptions without which the manager was not permitted to take a single step. But nothing has changed.

We do not wish to say that the skills and abilities of the managers have remained at the previous level. On the contrary, the proposed methods and devices for increasing the effectiveness of their activity have produced an effect and have brought fairly rich fruits. But the content of the manager's work day has remained the same. There is still the same dictatorship of current affairs and trivia. The same sea of various questions on which it is impossible to concentrate, the fulfillment of duties for subordinates, the remoteness from long-range problems, the lack of attention to increasing their own education...and all of this runs counter to the theoretical provisions and recommendations. But here is the paradox: management activity has produced relatively good results and provided for the required movement forward. Why?

Perhaps the existing scientific recommendations in the area of management are unsuitable if the result is obtained in spite of them? In order to answer this question we conducted a study of the work day of 30 directors and their deputies in five average-sized production associations and at enterprises of various branches of industry in Estonia. We obtained a time and motion study of a total of 556 man-hours. A brief test question was intended to clarify certain additional aspects. The investigation was conducted at the beginning, in the middle and at the end of the year, and also at the end of the semester and the last days of each month in order to avoid randomness. We shall present certain of its results and comment on them.

The length of the work day went beyond 8 hours: the general director—564 minutes, the head engineer—534, the director for production—502, the commercial director—507, the director for economics—492, and the director for construction—504 minutes. This did not take into account the time before and after the end of the working day that was spent outside the enterprise. Is the great length of the work day a fatal inevitability? No, it can be reduced.

Various managers spend from 28 to 55 percent of their working time outside their offices (among the enterprises the range of differences is from 5 to 76 percent). The questionnaire showed that managers spent an average of 50 percent of their time on business outside the framework of the normal working day less than 1 day a week, 20 percent—1 day, and 30 percent—more than 1 day a week. Where might one look for those who were not in their offices? From 51 to 98 percent—at their own enterprise. And the head engineer, and the director for economics and production spend almost all day at the enterprise and not in their offices while the general director and his deputy for construction spend only half of their time in their offices. Usually the managers are drawn to "their own" subdivisions: of the time spent at the enterprise but outside of their offices the directors for economics, production, the commercial director and the head engineer spend 51 percent of their time in the economic services, 40 percent in production services, 30 percent in commercial services and 33 percent in technical services, respectively. The director for construction spends the least amount—23 percent of the working time outside of the office at his enterprise.

Meetings and conferences took up from 17 to 40 percent of the "nonoffice" time, lasting from 20 minutes to 4 hours a day and more. In certain enterprises the range was considerably greater. The directors for construction and commercial activity spent the least amount of time in these, and all the rest of them spent the same amount. The general director, the head engineer and the director for production spent the largest amount of time in receiving delegations, granting awards and other "ceremonial" duties, but they spend no more than 10 percent. The managers spend about a half hour on dinner, or 4-5 percent of their working time.

Most of the working time spent outside the office and outside the enterprise goes for visiting other enterprises and organizations. The demands of the higher agencies, as a rule, are not great—up to 10 percent (in individual enterprises there are even more appreciable differences). Moreover, it is mainly the general director, the commercial director and the director for economics who are called outside the enterprise.

An important part of the working day (from 9 to 35 percent) of the top-level managers is taken up by planned and unplanned receptions and various kinds of meetings (discussions, negotiations, reception of delegations and so forth). Time expenditures for these purposes vary considerably: for some directors—3 percent and for others—68 percent. There was also an essential difference in the number of visitors—from 3 to 36 per day. This was the most stable for commercial directors, and half of the visitors were co-workers of subdivisions directly under their jurisdiction. From 66 to 94 percent of the time spent on meetings among those questioned went for receiving workers of their own

enterprise. It was mainly the general director and the director for production who received guests--about one-third of the time spent on receiving visitors.

The data from the investigations showed that subordinates come to the office for three reasons: because the manager has called them in, on their own initiative concerning business and concerning private affairs. In the first case, the time expenditures are minimal because both sides have prepared for the conversation ahead of time. Conversations on private matters regularly take up 5 percent of the managers' working time. Visits on business continued longest of all, apparently because the manager had to delve into the problem and gather the necessary information.

The third important "consumer" of the managers' time was work with documents, taking an average of from 15 to 30 percent of the time. Paperwork takes up a great deal of the time of the directors for economics, construction and production, and much less of the time of the general director, the head engineer and the commercial director. In a number of enterprises that were investigated these time expenditures were approximately the same only for the head engineers, and for the rest of the directors they differed significantly: general directors--from 6 to 25 percent; directors for production--from 1 to 52 percent, commercial directors from 9 to 29 percent, directors for economics from 11 to 23 percent, and directors for construction--from 20 to 41 percent.

The differences are explained mainly by the length of service of the people investigated, the division of labor between them and their subordinates, and the organization of the labor of the general director's secretary. Certifying documents is basically the duty of general directors and head engineers and it is distributed more or less uniformly throughout the enterprises, on the whole not exceeding 5 percent of the working time of those who were investigated.

In fourth position are telephone conversations. They absorbed from 6 to 17 percent of the working time of the managers. The least amount of time was spent "on the line" by directors for construction: 16 times a day taking up 29 minutes or 6 percent of the working day. For the others the number of conversations ranged from 22 to 50 (commercial directors) with an overall duration of from 56 (director for economics) to 87 minutes. The directors for construction spend more time at the construction sites and take care of their coordination work there.

From half to 75 percent of the telephone conversations were communication with workers of their own enterprise, especially for the directors for production, economics and the head engineer. The commercial director and also the general director were most involved in negotiations with other enterprises. The latter communicates on the telephone mainly with higher agencies.

In two-thirds of the cases the managers were the ones who made the calls, which is not surprising: after all, they spend a large part of their time outside the office and when they return there they wish to obtain some information from outside. The ones that produced the best results were conversations where both people knew one another by name and when there were no differences in their job position, any personal animosity or the like.

We cannot state that the results of this investigation can be extended unconditionally to other enterprises. These specific features of the economic organizations, the division of labor among the managers and subordinates, the style of management and other factors—all these, undoubtedly, caused differences. But in spite of the stipulations the results of our investigation make it possible to draw certain generalizations concerning the nature of the working day of the top-level manager and his activity in general.

"Director" or "Fireman"

There is the widespread opinion that the manager should work strictly according to a schedule, foresee future problems and take the appropriate measures ahead of time without allowing anything random or unexpected. In real life things look quite different. His activity is extremely diverse and difficult to predict. During the course of the working day people come to the general director for one reason or another an average of from 38 to 80 times, the director for production—26-73, the head engineer—28-69, and the commercial director—42-102 times, and people come to the other directors somewhat less frequently. Moreover directors are outside of their offices for up to half of the time. As a result they are in a hurry, jumping from one issue to another. The rhythm turns out to be jerky and unstable, and their haste makes it impossible to concentrate. Everyone wants to have his bit of time with the director and there is no turning them away. A half hour without a phone call or a conversation is a luxury which occurs maybe two to three times a week.

How does one find a solution? It is expedient to draw up the schedule of the working day not in terms of minutes and not in terms of operations, but in terms of days of the week, in terms of consolidated jobs and actions, and groups of operations, writing down only the immediate issues. The support points can be the regular gatherings and meetings in which many people are involved. Thus one achieves regularity in the work of the associates as well. Incidentally, at the enterprises that were investigated the conferences were not held very regularly nor were they well thought out. Unexpected demands from higher agencies which could be met by specialists of a lower rank but which nonetheless were handled by the top managers also had a negative effect on the schedule of the working day of literally the entire collective of the enterprise.

The nature of the activity of the managers is determined largely by their thirst for information which is necessary for successful activity, planning and mastery of the situation. Hence the large amount of attention that is paid to obtaining, processing and transferring information, calling in subordinates, receiving them, telephone conversations and visits to subdivisions and other enterprises.

Contacts as Compared to Documents

There is the widespread assumption that documents are normative acts and that official correspondence (or "firm" information) comprise if not the basis of

management activity, at least the core of management decisions. It is thought that documents are or should be the basis for constructing plans, communications, actions and evaluations of the manager. The investigation forces us to revise this idea. The flow of documentation has the tendency toward increasing, but the load of the managers with documents takes up little more than 2 hours for half of them and less than an hour a day for the other half.

Those who were investigated, while on the whole recognizing the significance of documents, do not like to deal with them and try to avoid them as much as possible. It is difficult to imagine a greater joy for the manager than when he can put a document in the garbage can or leave it without a written response. It has been noted: the older the person who was being investigated and the higher his rank, the stronger his aversion to "papers." This reflects the desire to free themselves for more important matters. But certain managers, trying to save their subordinates from the flow of paper, "bring the fire down upon themselves." They drown in this flow or else they do not, but they have plenty of concerns.

The investigation showed that under certain conditions the managers prefer direct contacts or "soft" information. Here the picture seems more visual and objective to them, and the decisions that are made seem better substantiated. Hence one can understand the corresponding actions and the structure of the working day. Three-fourths of the working time is devoted to obtaining "soft" information. Three-fourths of those investigated prefer to obtain information personally on the spot, and 20 percent--in their offices when receiving visitors. The second channel is the telephone. Only one of those questioned put written information in first place. When there is a lack of a good contact for any reason it becomes difficult to transmit information.

From what has been said it can be concluded that one should plan first of all the necessary contacts. It is also important for subordinates, colleagues and guests to have a more clear idea of who to turn to and formulate more precisely the questions requiring discussion and the adoption decisions.

Detail as Compared to Generalization

This opinion is also going around: only official sources of information provide justification for making management decisions and therefore it is necessary to become comprehensively familiar with this information. Moreover, the higher the rank of the manager, the greater the amount of summary, generalized information he requires, and again from official sources. Our investigation only partially confirmed this opinion.

According to the estimates of those questioned only one out of 10 letters that come into the enterprise are so important that they require immediate actions. The majority of statistical summaries and computer printouts pertain only to the functions of individual specialists, and not to high-ranking managers. The latter reveal problems and arrange plans for solving them not so much on the basis of official information, summaries and reports as from detailed informal information obtained from conversations, personal observations and simple calculations based on some specific events that signal the course of

affairs, externally random data, evaluations of the situation and so forth. Official sources either do not provide the required knowledge at all or they are very late in providing it. The "data banks" are in the head of the manager. At the majority of the enterprises the ASUP is still not sufficiently oriented toward concrete needs of the managers and is not sufficiently mobile, so they give more of an idea about tomorrow than today.

The Present or the Future

It is thought that the manager is basically engaged in solving current problems, devoting very little attention to the future. Consequently, streamlining his working day means increasing the proportion of long-range problems. The good manager is the one who thinks deeply and plans carefully, devoting a sufficient amount of time to this.

The time and motion study of the work day, it would seem, confirmed this hypothesis. Only in two out of 30 cases did we register solutions to long-range problems, which took about an hour and a half. It would be interesting to know when those who were questioned engage in long-range, large-scale problems. Taking into account the importance of the question, we continued the investigation. For it is quite probable that the period of the investigation was a random one and those conducting the time and motion study of the work day were not competent enough to separate current tasks from long-range ones. Moreover, from the conversations with the managers and from our own experience we were well aware that they do have an idea about the future and they have prepared variants for achievements in the future.

The questionnaire showed that those who were investigated engage in the future on an average of once a week in their work position, but more frequently before and after work. The exceptions were the directors for construction and economics, who confirmed that they participate in planning for the future every day. Thus we confirmed how difficult it is for the outside observer to distinguish between current and long-range problems. One general director put it this way: "Revealing long-range problems and determining the principal possible variants for solving them take place during the course of making decisions regarding current issues." And so, investigator, try to make a distinction here!

Thus management as a practical activity hardly forms strategies that direct the gaze into the distant future. The manager is first and foremost the person who reacts immediately to impulses which he receives, and his immediate action takes precedence over delayed action. If he must plan something for the future this takes place during the course of concrete current work, in parallel with the performance of other functions, and not in separation from them. No special time is allotted for this, either in the office or outside it.

Plans for the future frequently exist only in the minds of the managers, in the form of flexible but fairly concrete plans and intentions. Unfortunately, current affairs do not allow them to sufficiently familiarize other workers of the enterprise with these plans, and sometimes they even forget about the need for this. As a result, at the enterprise there is a multitude of variants of

solutions to problems in the air and little unity. The task of the consultation assistance we rendered consists therefore in achieving unity and forming a general plan of a strategic nature.

Public Work, Stress and Rest

There is the order that the manager during the course of the working day must engage only in that activity which corresponds precisely to his official instructions and normative documents. Everything that lies outside this framework is his own personal affair and nonworking time should be spent on it. But the investigation showed this picture: the managers spent 2, 3 or more hours a day on business not related directly to their new basic work. In their offices and outside of them, during working time and during nonworking time.

Managers devote a good deal of time to public works, and the more qualified they are and the higher the position they occupy, the more time they spend for these purposes. But these do not figure in official instructions either. Public activity should be included in the official instructions. Then the instructions would come closer to reality and there would be less misunderstanding in the evaluation of the activity of the manager and his role. This would explain to the higher agencies and the subordinates, for example, why the manager is not always so quick in his decisions and actions as they would like him to be.

A half hour for dinner—that is all the rest the manager gets, and this is filled with business conversations. Naturally, this is not enough. Stress, various diseases, unpleasantness at work and in the family—all these are lying in wait for those whose physical and psychological health are inadequate. It is necessary to introduce for managers at least breaks of 15-20 minutes before and after dinner. The effectiveness of their work will also increase because of these breaks.

Today is the age of the computer and scientific methods of management. But, in our opinion, we sometimes forget about the subject of management, about the labor and activity of the manager. For a number of years now, in our opinion, nobody had seriously raised the question of the essence of management activity. A lack of understanding and sometimes even a distorted understanding of this activity, and the numerous shortcomings in the work of enterprises and outside them that ensue from this—all this requires study and correction.

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LABOR INTENSIVENESS, PRODUCTIVITY DISCUSSED

Novosibirsk *EKONOMIKA I ORGANIZATSIYA PROMYSHLENNOGO PROIZVODSTVA* (EKO) in Russian No 4, Apr 86 pp 144-150

[Discussion by Ye. B. Gorbunov, engineer-mechanic (Gorkiy): "Labor-Intensiveness and Increasing Its Productivity"]

[Text] A revision of a norm usually means an increase in number of parts processed per shift and increased employment of the worker. In a number of cases there is also an increase in the weight of the implement of production or object of labor, which the worker must move by hand during the process of performing the operation. In other words, the intensiveness of labor can increase while the wages remain at the previous level.

Workers employed in norm setting and organization of labor cannot change the existing practice. In keeping with the existing wage rate system any work envisioned by the norm with labor expenditures is done within the limits of the normal intensiveness of labor, and hence the differentiation of wages depending in the change of the level of intensiveness of labor is not sufficiently envisioned.

Some economists explained this situation by the fact that under socialism under all work positions there is only the normal labor-intensiveness and therefore it is not considered necessary to differentiate wages depending on the change in the level of labor intensiveness. Others, while recognizing a need for this, blame the lack of methods of measuring intensiveness (physical and nervous energy which determines the intention of labor).

Changes in the wage rate system brought about by this shortcoming began in 1959 when, in addition to abolishing the eight-category wage network and introducing a six category one, they also abolished branch wage rate-skills references and replace them with the Unified Wage Rate-Skills Reference (YeTKS). The branch references, in addition to factors that determine the knowledge and ability of the worker, also consider indicators that characterize the intensiveness of labor such as the weight of the part that is being processed, the combining of occupations and the servicing of more than one machine tool. Having decided that these indicators do not characterize the qualifications of the worker (with which one must agree, even if not fully), and having eliminated from them a number of factors that determine the

category of work and the worker, the USSR State Committee for Labor and Social Problems has not granted the enterprises other ways of differentiating wages depending on changes on the intensiveness of labor if they are envisioned by the norm for labor expenditures.

According to the existing wage rate system it is thought that this differentiation can be carried out through the utilization of a list of occupations and jobs with increased difficulty and harmfulness which, in the opinion of those who drew it up, makes it possible to include the work in various wage rates, depending on its difficulty. But if one looks at this list carefully one is convinced that it includes only jobs which are characterized by a high level of harmfulness and it includes no occupations or jobs at all that are distinguished by a higher level of difficulty.

Having excluded from the wage rate-skills reference the servicing of more than one machine tool (more than one set of equipment) as an indicator of the qualifications of the worker, the State Committee for Labor and Social Problems published provisions concerning the payment for the labor of operators of more than one machine tool, which envision that they are given additional compensation for their work only when they are employed on machine tools in excess of the established service norm. And within the limits of the norm the labor should be paid for without additional compensation.

But here is the misfortune: at machine-building enterprises the norms for service with respect to individual kinds and types of production are determined by various methods, which in general preclude the possibility of service at machine tools in excess of the norm (if decalculation is brought in line with the established rules). It is thus impossible to increase the wages of people who operate more than one machine tool over those who service only one.

In order to materially motivate the worker to service several machine tools, in practice when calculating the piece rate they reduce the number of machine tools serviced as compared to the norm so that the actual number of them remains at the level of the calculated norm which, naturally, reduces the quality of the norms that are in effect.

Under the conditions of flow lines in machine shops the number of machine tools serviced (the service norm) is determined on the basis of the following rule: the cycle for processing a part in a work position with more than one machine tool, taking into account expenditures of time on organizational and technical servicing and rest, should not exceed the time unit in the rhythm of the flow line.

The peculiarity of flow-line production dictates the need for its technological and organizational synchronization—equalization of time expenditures on the manufacture of parts in all the work positions of the flow line within the framework of the unit of flow-line rhythm. This circumstance does not allow loading the worker in a work position with more than one machine tool in excess of the time set by the rhythm which, in turn, precludes the possibility of assigning machine tools to the work position in excess of the calculated service norm. Thus, as in the previous case, the possibility

of utilizing the provisions concerning wages for machine tool operators is precluded.

In the galvanizing sections the worker or brigade of workers must service all the main baths assigned to the section. The number of baths is established on the basis of the plan for the output of items and the handling capacity of the baths. Under these conditions the norm setting for labor is reduced to a calculation of the necessary number of workers servicing the sections and a determination of their employment. The existing practice precludes the possibility of increasing the established norm for service for the worker or brigade of workers and thus establishes a material incentive for handling more than one work position.

In the variants of servicing more than one work position that have been considered the need for differentiation of wages for the various work positions is dictated by the fact that the number of machine tools (aggregates) assigned to a work position is greater than the norm, as is envisioned by the provisions, and by the difference in the amount of employment of the worker (brigade of workers) with respect to their service.

In the final analysis the provisions concerning wages for people who service more than one machine tool do not allow the possibility of differentiating their wages for the various work positions depending on the level of employment, the weight of the parts that are processed, or the shift cargo turnover, and, consequently, they do not make it possible to consider the intensiveness of the measure of labor when organizing wages. There are "advantageous" and "disadvantageous" norms and jobs, and the motivation for increasing labor productivity decreases.

It should be noted that the lack of accounting for the intensiveness of labor impedes the growth of its productivity not only in work positions with more than one machine tool, but in others as well. One can become convinced of this by considering the practice of applying the decree of the USSR Council of Ministers, "On the Policy and Conditions for Combining Occupations (Provisions)" of 4 December 1981. In point 12, which said: "Additional payments for combining occupations (positions) are not established in those cases where the combined work is envisioned in the norms for labor expenditures, stipulated by a labor agreement (is included in the range of duties of the worker) or is assigned to the worker under a policy established by legislation in connection with an inadequate loading as compared to the existing norms for labor expenditures in the basic job."

This means that if a worker employed on a flow line during the established time of the cycle services a machine tool and performs fitter work, his piece rate should be determined on the basis of the time norm of the cycle and the hourly rate for the established category of work. The circumstance of the worker when servicing the machine tool and performing fitter work has increased the intensiveness of his labor as compared to that which existed when performing one of the aforementioned jobs is not taken into account when determining the piece rate. This does not contribute to increasing the motivation to increase labor productivity as a result of expanding the service zones.

Here is an example. A worker who runs an automated spring packing machine has performed the assembly of the items at the same time. For each of the combined jobs the administration has established its own time norm and rate, which does not envision the possibility of combining jobs. This has made it possible for the worker to obtain a double rate for the shift. Why has the administration selected this variant of the organization of labor? In all probability because the existing provisions concerning wages when combining occupations have not made it possible to select the intermediate variant which is based on a partial increase instead of a double increase in the wage rate for the worker because of his increased employment resulting from combining jobs. The administration could not leave the wages at the level of the shift rate since the worker would never accept that variant.

What indicators determine the level of intensiveness of labor and how should they be taken into account when establishing the amount of the wage? These indicators differ for all categories of workers in various branches of the national economy. For piece rate workers in machine-building enterprises, in our opinion, they should be as follows:

the coefficient of employment of the worker in work time or in the cycle for processing. This is determined as the ratio between the employment of the worker when performing the normed work and the operating time or the time of the cycle for processing;

one-time maximum effort, which the worker expends on performing a job. This is taken to be equal to the mass (weight) of the object or implement of labor that is moved by the worker by hand during the process of performing the labor operation;

shift loading for the labor of the worker.

In order to organize the labor of piece-rate workers (workers who operate more than one machine tool or combine occupations and also those of other categories of workers) in a justified way taking the aforementioned indicators of intensiveness of labor into account, it would be expedient to have a system of increments to the hourly rate which makes it possible to differentiate the wages depending on the intensiveness of the labor.

The aforementioned system is given in the table. Now the increment to the hourly rate is calculated, first, for bonuses for workers who fulfill the norm (40-60 percent of the amount of the normed wage); second, when the piece rate is increased up to 20 percent when the worker is transferred to work according to technically substantiated norms; third, for a one-time bonus for workers on whose initiative the revision of the norms is carried out (30 percent of the savings on the normed wages as a result of the revision of the norms). If the enterprises were granted the right to use this money for paying the increments, the proposed system of increments could be carried out at every enterprise without increasing its wage fund.

Table

(1) Коэффициент за- грузки рабочего в оперативном про- цессе или тако- (цикла) обработки до:	(2) Сменная грузо- подъемность труда рабочего, в кг/мин до:	Масса (вес) предмета или орудия труда, перемещаемых рабочим в процессе ра- боты, в кг до: (3)											
		1	2	4	6	9	12	18	20	25	св. 25		
		надбавка к часовой ставке, в коп. (4)											
1	2	3	4	5	6	7	8	9	10	11	12		
0,5	200	—	—	1	3	6	9	13	17	22	27		
	400	—	1	3	5	8	11	15	19	24	29		
	600	1	3	5	7	10	13	17	21	26	31		
	1000	5	7	9	12	14	17	21	25	30	35		
	1500	10	12	14	16	18	22	26	30	35	40		
0,5	2000	15	16	18	20	24	27	31	35	40	45		
0,6	More than 2000	20	21	23	25	29	32	36	40	45	50		
	200	2	3	5	7	10	13	17	21	26	31		
	400	4	5	7	9	12	15	19	23	28	33		
	600	6	7	9	11	14	17	21	25	30	35		
	1000	10	11	13	15	18	21	25	29	34	39		
0,7	1500	15	16	18	20	23	26	30	34	39	44		
	2000	20	21	23	25	28	31	35	39	44	49		
	More than 2000	25	26	28	30	33	36	40	44	49	53		
	200	8	9	11	14	17	21	25	29	34	39		
	400	10	11	13	16	19	23	27	31	36	41		
0,8	600	12	13	15	18	21	25	29	33	38	43		
	1000	16	17	19	22	25	29	33	37	42	47		
	1500	21	22	24	27	30	34	37	42	47	52		
	2000	26	27	29	32	35	39	42	47	52	57		
	More than 2000	31	32	34	37	40	44	47	52	57	62		
0,9	200	14	15	17	19	22	26	30	34	39	44		
	400	16	17	19	21	24	29	32	37	42	47		
	600	18	19	21	23	26	31	35	39	43	48		
	1000	23	24	26	28	32	36	39	44	49	54		
	1500	28	29	31	33	37	41	44	49	54	59		
1,0	2000	33	34	36	38	42	46	49	54	59	64		
	More than 2000	38	39	41	43	47	52	54	59	64	67		
	200	20	21	23	25	28	31	35	39	44	49		
	400	22	23	25	27	30	33	37	41	46	51		
	600	24	25	27	29	32	35	39	43	48	53		
1,0	1000	28	29	31	33	36	39	43	47	52	57		
	1500	33	34	36	38	41	44	48	52	57	62		
	2000	38	39	41	43	46	49	53	57	62	67		
	More than 2000	43	44	46	48	51	54	58	62	67	72		
	200	25	26	28	30	33	36	40	44	49	54		
1,0	400	27	28	30	32	35	38	42	46	51	56		
	600	30	31	33	35	38	41	45	49	54	59		
	1000	34	35	37	39	42	45	49	54	59	64		
	1500	39	40	42	44	47	49	54	59	64	69		
	2000	44	45	47	49	52	54	59	64	69	74		
1,0	More than 2000	49	50	52	54	57	59	64	69	74	79		

Key:

1. Coefficient of worker's employment in operating time or processing cycle up to:
2. Shift load-difficulty of worker's labor in kg/min, up to:
3. Mass (weight) of object or implement of labor moved by worker in process of work, in kg up to:
4. Increment to hourly rate, in kopecks

The introduction of a system of increments to the hourly wage rate depending on the level of intensiveness of the labor will increase the motivation of the workers to increase labor productivity and will relieve the time norm of the role of regulating the level of wages which it is now performing.

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EFFECTIVENESS OF NORMS, INCENTIVES INVESTIGATED

Novosibirsk *EKONOMIKA I ORGANIZATSIYA PROMYSHLENNOGO PROIZVODSTVA* (ENO) in Russian No 4, Apr 86 pp 150-156

[Article by V. B. Bronshteyn, candidate of economic sciences, Radio Plant imeni 50-Letiye SSSR (Irkutsk): "On Norms and Stimuli"]

[Text] Material incentives are a most important lever for increasing the effectiveness of production. But why do their "shoulders" sometimes turn out not to be strong enough? In order to answer this question an investigation was conducted at the Irkutsk Radio Plant. In addition to the data from it, information from other enterprises of the oblast was used.

The investigation revealed several factors that reduce the effectiveness of material incentives. The main one is the varying difficulty of the output norms and the guaranteed payment of bonuses.

What is the mechanism of their effect and their appearance? The norms for times and rates are formed in two stages: when preparing the production of new items and during the course of this production, when the norms are revised annually because there are changes in the technology, organization of labor, and sanitary-hygienic and other conditions. The technical measures reflected in the technological documentation, according to the information from the investigation, covers only 20-40 percent of the assignments for reducing labor-intensiveness. This is precisely why a considerable proportion of the advised norms seem to many participants in production (67 percent of the workers questioned and 51 percent of the foremen) not to be backed up by any real transformations.

This opinion, of course, is incorrect. Those who were questioned were not taking into account that labor productivity in the work position was increased partially because of such technical, organizational and socioeconomic measures as reconstruction of the shop, by seriously improving working conditions, training in courses for increasing qualifications, the introduction of the system of comprehensive regulation of the service of work positions and so forth, which required significant material expenditures from the enterprise. But this opinion remains, particularly because of the lack of scientifically substantiated methods for calculating the economic effects resulting from such measures and also because of a lack of the corresponding explanatory and

educational work. Existing experience shows that workers not only are convinced of the need to revise the norms but, having figured out their essence along with the administration and specialists, they themselves are beginning to actively initiate and conduct such a revision.

Labor productivity is increased by cleaning up the premises, improving the temperature conditions by using ventilation systems and air conditioners, improving the forms of organization and incentives for labor, increasing the skills of the workers, and increasing series output of products. Taking all this into account "from above," how does one establish equally difficult individual assignments for reducing labor-intensiveness?

From the results of observations made by the author in the role of the senior foremen and then by the chief of the processing and assembly shops it became clear that the second stage of norm setting does not always contribute to improving the quality of the norms. Insufficiently substantiated rates are usually found for items that have been manufactured for more than 1 year, after which the time norms for them had been repeatedly revised. The conclusion was supported by 73 percent of the workers of those who had found jobs in their collectives that were advantageous to varying degrees.

Obviously, without the proper explanatory and educational work the piece rate workers will be materially motivated to have minimum assignments when the output norms are revised. To this one must add the fact that engineering and technical personnel of the enterprise who are entrusted to conduct this work are not sufficiently interested in continuous, systematic improvement of the norms and therefore they do not always provide for an individual approach to each worker.

This is how the campaign for revision is usually conducted. Initially the manager of the enterprise establishes the planning figures for reducing the labor-intensiveness of the items for the shops and then the senior norm setter and shop chief preliminarily "distribute" the assignments among the sections, frequently without any strict method. An example of this could be the experienced managers who take into account the level achieved by the subdivisions in the fulfillment of output norms, the average wages, the average category of work, the working conditions, the coefficient of personnel turnover, the position of the section in the technological chain, and the length of service and age of the workers. Formalized methods or recommendations for distributing the assignments for reducing labor-intensiveness were not found in a single one of the enterprises that were investigated. It is clear that it is necessary to be oriented from experience.

Subsequently the assignment for revising the norms is coordinated with the public organizations of the shops and submitted to the foremen for their information. This stage is considered the preparatory stage, but it is extremely important, because if it is not well thought out nervous tension can arise. One must not fail to take into account the fact that the calculated labor-intensiveness, the planned number of personnel and bonuses for engineering and technical personnel of the shops as well as the foremen during the course of the year depend on the assignments for reducing labor-

intensiveness. It is not surprising that the majority of people questioned were not in favor of increasing the assignments as compared to the past year. Analysis shows that in places where the proper amount of attention was devoted to the preliminary stage nobody had any doubt about the need to increase the assignments.

The manager must use his authority and experience to convince everyone in the shop. This takes about 40 percent of the working time for 2 or sometimes even 3 months. And still the shop chiefs think that they are not managing to avoid a deterioration of the moral and psychological climate, and the number of conflicts registered during this period is two-fifths greater than at times outside this period. Analysis shows that a good deal of time is spent on persuasion, but the content is not always satisfactory. Hence the effectiveness is also inadequate. Those questioned give their own ways of improving the work for persuasion, which should be generalized and extensively disseminated.

Finally, the time has come to reduce the labor-intensiveness for a considerable part of the products list, which is usually assigned to particular workers. In this stage all engineering and technical personnel are materially motivated to conduct a high-quality revision of the norms since the disparity between the norm and the assignment deprives them of their bonus throughout the entire year.

By analyzing the structure of the wages one can reveal the material motives that appear in the workers. The amount of the piece-rate part of their earnings is fully determined by the amount of the rates and the number of parts that are manufactured. The bonus, even though it may depend on many factors, is directly proportional to the piece-rate earnings. Consequently, the rates affect it too, and so the piece-rate worker is not easily persuaded to reduce the labor-intensiveness. Unfortunately, not a single one of the enterprises that were investigated had made the bonus dependent on the fulfillment of assignments for revising output norms or on how the wage fund was expended in the section or shop. Only 18 percent of the workers questioned noted that for successfully conducting the revision of the norms they are paid some of the savings achieved by this, although the corresponding provisions concerning bonuses for revision on the initiative of the workers (the Aksay method) were available at all the enterprises that were investigated. The weakness of this incentive was pointed out by 92 percent of the managers since the incentives for increasing norms on the initiative of the workers are based on 3- or 6-month savings (with a reduction of labor-intensiveness of 10 and 15 percent, respectively). But if the labor intensiveness is not reduced, the old norms remain in effect for 5-10 years, until the item is removed from production.

And again one should recall what an important role is played by persuasion, appeal to the conscience of the workers and clarification of the need to increase labor productivity at more rapid rates than wages are increased. In places where the proper amount of attention is not devoted to developing high moral qualities in the collective, various "compressors" go into motion. Most frequently the reduction of the labor-intensiveness is compensated for by a proportional increase in the monthly bonus, and the percentage of

overfulfillment of the norms is sharply reduced while the wages and labor productivity remain practically the same.

More than two-fifths of the workers questioned noted that the reduction of the labor-intensiveness is usually accompanied by an increase in bonuses. Of these 58 percent think that the former is considerably more than the latter, and the rest think that there is no essential difference. The national economy and the enterprise can hardly stand to gain from such a reduction of the percentage of overfulfillment of the norms. Moreover, this kind of operation can be conducted only with the agreement of the workers. Frequently foremen and norm setters who have little experience with this kind of "improvement" of norm setting achieve the agreement of the workers through promises to pay them bonuses all the time, regardless of the results of their labor, even when there are violations of discipline. The use of this argument was noted by 82 percent of the respondents. As a result it is difficult to achieve a situation where the workers look on the bonus from the wage fund as an incentive. A reduction or a failure to pay it—usually when there are serious violations of discipline—are regarded as punishment.

Another kind of "compromise" can be seen when there is not a formal, but an actual reduction of labor-intensiveness. Here the foreman must solve the most complicated problem—obtain support from the unofficial leaders of the section. Therefore the most experienced workers who have authority and form public opinion are frequently given minimum assignments by the managers. It is not surprising that unfair distribution of work was mentioned by 82 percent of the workers with less than 3 years of service, 51 percent with 3-5 years, 32 percent with 5-10 years and only 17 percent with more than 10 years. In places where there are deviations from the socialist principle of distribution, it was said at the plenum of the CPSU Central Committee on 11 March 1985, there will inevitably be violations of social justice, which is an important factor in the unity and stability of the socialist society.

At 10 out of 11 enterprises work for improving the system of revising norms is not conducted systematically. Even by the end of the second quarter the annual assignment for reducing rates is fulfilled by 75 percent, and for increasing labor productivity—by 84.5 percent, while in the fourth quarter the work is halted altogether. And even at the beginning of the year it is basically limited to one-time measures. Engineer-norm-setters during the first quarter are not in a position to check on the quality of the norms, and 72 percent of the foremen and brigade leaders who were questioned pointed out the weak assistance they were given in regard to this matter.

The decline in activity by the end of the year is explained by the fact that the amount by which the fulfillment of the output norm is covered becomes obvious, that is, reserves for increasing labor productivity have been utilized. It is precisely in terms of the percentage of overfulfillment that one judges the amount of the assignment for reducing labor-intensiveness in the subsequent year. This is what 79 percent of those who were questioned think. In the first quarter the rates of growth of labor productivity are somewhat lower than the rates of revision of the norms and hence there is a certain reduction of the earnings of piece-rate workers. Subsequently the ratio changes. By the end of the current year the accumulation of reserves

for increasing labor productivity is included in the next campaign for revising norms.

In order for the earnings not to be reduced when the norms are revised the workers must increase the number of part-operations they perform, that is, they must increase the productivity of their labor. The "dead season" in the third and fourth quarters and the lack of improvement of norm setting nullifies the growth of labor productivity. But why, in spite of the negative consequences, is this irregularity not being eliminated at 10 out of the 11 enterprises that were investigated? If the revision were conducted uniformly, in the opinion of 97 percent of those questioned, they would not fulfill the established assignment for the conventional annual savings, which is directly proportional to the quantity of parts produced at the moment of the reduction of the labor-intensiveness before the end of the current year. This means that the methods for calculating the given effect should be revised. So far the reduction of the rates which is done at the beginning of the second half of the year produces half the effect that it would produce at the beginning of the first half of the year. It is necessary to change from the calculation period of the current year to a longer period of from 3-5 years, for which one would determine the conventional economic effect from the revision of time and rate norms.

With this approach the interest in the campaigns for revising norms disappears. The revision can be conducted individually, with each member of the collective according to a previously established schedule, and with no more than one or two workers at a given time. The revised norms will then become stable for the year. This will make it possible to overcome the collective material interest in retaining the existing norms. It is necessary for the assignments for revising outdated norms which are previously established for each month to be a condition for the payment of bonuses to each worker. The collective's interest will then be directed toward rendering assistance to those who have come up for revision.

It would be expedient to overcome the shortcomings in incentives for increasing labor productivity also through rejecting the piece-rate-plus-bonus system of payment and changing over to the piece-rate-time-rate system, where a constant part of the earnings is paid, regardless of the amounts of the output (from 30 to 50 percent of the wage rate) and the piece-rate part is formed according to the reduction of the wage rates and increases in proportion to the increase in labor productivity. The existence of a constant part guarantees that the rates of growth of productivity will be greater than the rates of growth of wages even when there is no campaign for reducing labor-intensiveness.

Attention should also be given to the suggestion to limit the maximum possible amount of the piece-rate part of the earnings. Here the only source of increasing wages will be systematic payments of additional bonuses to workers for reducing labor-intensiveness from the material incentive fund. Such a bonus should be an appreciable addition to the maximum piece-rate earnings. The fact that it is the only source of additional payments is undoubtedly an incentive and will create interest in revising output norms. It is also reasonable to take advantage of the piece-rate regressive payment for labor.

A detailed development of any of the systems listed above would not present any special difficulties. A number of collectives of enterprises also have practical work experience. Since July 1970 a new system of wages has been in effect which, in our opinion, is free of the antisymptoms for improving the quality of labor that are inherent in the piece-rate-plus-bonus system: the USSR State Committee for Labor and Social Problems, the AUOCTU and the board of the Ministry of the Automotive Industry have adopted a decree concerning changing over to normative payment for workers at VAZ. The majority of managers questioned agree with the need to improve the procedures for reducing labor-intensiveness. At the same time they also disclosed difficulties which impede this, above all the low level of long-range technical and economic planning. In the branches there is no firm confidence in the stability and, on the contrary, at eight enterprises people were convinced of probable repeated changes in planning assignments. Therefore it would hardly be expedient to base a long-range detailed calculation of assignments for increasing labor productivity on these.

Another difficulty is that many managers, when there is a shortage of personnel, are not interested in maintaining a correspondence between the growth of labor productivity and wages. It is possible to overcome this difficulty only by eliminating the departmental separation, creating territorial systems and mechanisms for distributing the labor force, and strengthening labor discipline, particularly getting rid of "rolling stones" who have the possibility of finding a way that is easy and profitable. Science is also faced with large tasks: we need efficient methods that "work" for conducting measures for norm setting. With good methods it is possible to eliminate a significant proportion of the negative social phenomena.

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URBANITES RETURN TO THE LAND

Novosibirsk *EKONOMIKA I ORGANIZATSIYA PROMYSHLENNOGO PROIZVODSTVA* (ENO) in Russian No 4, Apr 86 pp 157-179

[Article by Tatyana Boldyreva: "In the Special Design Bureau and in the Garden"]

[Text] It is a poor rural resident who has neither a garden nor an orchard. But today city dwellers too are "returning to the land" and therefore the number of private subsidiary farms is not decreasing. Their products comprise a significant addition to our table, the more so since our diet is far from optimal. Moreover, work in the fresh air is active recreation and improves the health of millions of people, it puts adolescents and children to work, and it provides employment for pensioners.

The party and government are devoting more attention to the development of gardening and orchard raising. At the April (1985) Plenum of the CPSU Central Committee, Comrade M. S. Gorbachev said: "Take just such a concrete issue as the development of garden and orchard societies. This is an extremely useful thing.... But so far it has not been properly developed. The need for garden plots and buildings, as well as construction materials is far from being fully satisfied. The Politburo...has given instructions to take the corresponding measures so as to maximally satisfy the demands of the people...."

Let us take a look at how industry is helping the owners of farmstead plots, gardens and orchards to fulfill their small "food programs."

From the Ministry to the Store

In 1984 645 enterprises of 76 ministries and departments were engaged in the production of garden and orchard equipment in the industry. During 1980-1984 its output increased 2.5-fold (in retail prices). The catalogue "Consumer Goods. Part II. Garden and Orchard Equipment and Sprinklers" includes 853 items. To be sure, certain of them are of the same type and some have not reached here. But in any case the figures are impressive and gratifying. Just think: it is difficult for the gardener and orchard raiser to select from such an abundance. Enterprises of the USSR Ministry of Ferrous Metallurgy are delivering the traditional instruments to trade (spades, pitchforks), the USSR Ministry of Machine Building for Animal Husbandry and

Fodder Production--means of minor mechanization for private barns and stys, and the USSR Ministry of Light and the Food Industry--scythes and sickles.

Enterprises of the Ministry of Agricultural Machine Building have the widest range of products. It includes motorized blocks and instruments for them and all kinds of mobile means of minor mechanization like motorized mowers; mechanized and hand sprinklers; mechanized and hand instruments, cards and wheelbarrows. The VPO Soyuztekhpromavtomativatsiya of this ministry is the head one for producing manual and mechanized garden and orchard supplies. I asked the chief of the technical division of the VPO, A. F. Nazarov, to evaluate the state of affairs with respect to the output of equipment.

"Trade orders for the list (32 kinds) of garden shares assigned to us are not fully satisfied. But everything will soon be in order here. And with everything else it is normal. Why do these not appear in the stores? This is a problem for trade--we are oriented toward its orders. Our enterprises produce and can produce everything that is necessary and as much of it as is necessary--in the list assigned to us. But maybe not order it. As for innovations, we have developed some advanced designs. We have proceeded not from the possibilities of industry as is usually done, but from demand: we have proceeded from the agricultural requirements for all kinds of work in various regions. We listen to the requests of gardeners and to the ideas expressed in the television program "Our Garden." And the quality has improved appreciably in recent years. Once every 3 years all of the plants that produce garden and orchard equipment must submit it for inspections which are organized by our ministry. We are proposing improving and completing the development of all poor-quality goods. This is a reliable guarantee against poor items. At the 1982 inspection remarks were made about 295 items, there were 190 proposals for radical improvement, it was suggested that 21 be removed and six be replaced. To be sure, not all the plants are showing their goods and especially, of course, those which have nothing worthy of praise. And sometimes the items are removed without being replaced by anything. GOST's have been introduced for all kinds of supplies. This also motivates the manufacturers. So on the whole everything is well with respect to manual instruments. But this is not yet true of mechanized instruments. The long-awaited minitractors, of course, have appeared for sale, although they have not yet reached their planned level of production....

What Do You Want, Gardener?

Quite recently the situation with garden and orchard supplies was desperate. In 1981, according to data of the USSR Ministry of Trade, only a couple of orders were filled from the long 200-page list of them. There were shortages of spades, scythes, sprinklers, hothouses, hoes, and many other things. Industry and trade were caught unawares by the rapid growth of farmstead plots.

And what now?

Let us drop into the specialized store "Goods for Gardeners and Orchard Growers" in Leningrad. On the outside it does not look very much like a respectable firm institution, but inside it is crowded. One immediately sees

that there are no choppers, watering cans, axes, shears or hoses for watering. The consumers are asking for inexpensive carts, wheels for mowers, small pitchforks (the ones that are for sale are too heavy), and inexpensive pumps of the Malysh type. And where are those gardening supplies which have been so plentiful and for so many years have been offered by inventors and skilled craftsmen? The magazine IZOBRETATEL I RATSIONALIZATOR has devoted more than one article to spades alone. So many spades and other instruments have been offered for sale! For instance, a spade with a lever which in a couple of hours can easily dig up a small garden, two-tined pitchforks (loosening is easier with them), universal weeders and many other things to facilitate labor. Where is all this? In the specialized store they answer briefly: "We sell what we receive."

The specialized store "Goods for the Gardener" in Novosibirsk is located a good distance from the center of the city. Here is a fair selection of goods, and there are shears and garden scissors which are in short supply. But the store's director G. V. Korobitsina complains about the crowdedness and the difficulties with delivering and processing the goods and fulfilling the plan.

"We have insignificant goods, and they take up a lot of space. There is not even anyplace to spread it out and show it. We have plenty of the traditional goods--the trade network supplies us first. But we have a shortage of garden pitchforks, ordinary looseners, cultivators, scythes and sickles. The fertilizers are basically all the same. The consumers ask for potassium nitrate and fertilizers for acid soil, but they do not send us these at all. Certain new goods are worse than the old ones and sometimes we do not even know what they are used for. We have various kinds of sprinklers, but all of them have their shortcomings, it is difficult to work with them, and not every man can handle them. The handles are rough, they are put on without drying, and then they dry out and fall off. As for innovations, in general there are very few of them. The consumers ask for things we have never heard of. We have only the traditional soil cultivation instruments. And here is something to think about. Look at these sets for 49 rubles--they are produced by the Kursk Spetsselevatormelmash Plant. Very few of them are purchased because they are very expensive. But frequently we are asked to put them in sets and sell the original soil cultivation instruments separately. But they are not produced separately. And they should be! In general in the brochures and advertising there is a lot that is new and interesting, but it does not reach Novosibirsk...."

Going around the other stores in the city, including the popular "One Thousand Knickknacks" we became convinced that the selection there is significantly worse. In the farm stores where there are a few goods in the storerooms they have the traditional hoes and rakes. This is what the consumers told us in one of the stores:

"They are just wasting iron! The spades and hoes are heavy, they rust quickly, they break, the earth sticks to them. All of the Tyulpan sets are made of nonrusting metal--they are sharp as a knife and they can remove a dandelion along with the root. And there is no point in buying tools made of ordinary iron." "The spades do not cut into the earth, they bend." "Those people at the plant should try themselves to pump a solution with their

backpack sprinklers! It is like pumping up a tire on a dump truck." "What have things come to: in the magazine they are recommending making a chopper out of an old saw. It turns out to be lighter and more durable. But why not make one out of good metal in the first place? We are from the country and plant potatoes. Try to work for an entire day with such a chopper--your arms will give out!"

We shall augment the opinions of the consumers with data from the questionnaire conducted in rural areas by the All-Union Scientific Research Institute of Economics of Trade and Management Systems. As it turned out, it is possible to purchase the most necessary supplies. But in the villages, as the researchers report, one can frequently hear: "We still have an ancient spade. They do not make them anywhere." Previously good, reliable tools were handed down from generation to generation. Now the spades, rakes, choppers and ketmens quickly rust, grow blunt and break. Manual sprinklers are inconvenient and there are no lightweight manual pumps. The demand for pumps, sprinklers and hothouses is satisfied by 50 percent and, and for vegetable seeders--25 percent. In the stores in remote rural points there are five-10 kinds of manual tools, and there is no technically complicated equipment at all....

We became convinced that, with the exception of individual brand name tools, this situation exists in many stores of large cities as well. And longing for the "good old spades" is not at all nostalgia about the past. It is not difficult to be convinced of this if one takes one of the modern tools in hand.

And They Buried the Spade...

It makes no difference to the consumer who is responsible for what in which ministry. He comes to the store, he does not see what he needs, and he draws the conclusion that it is primarily trade that is to blame. Let us take a look at what is bothering its representatives.

The deputy chief of the Roskhozorg Association, V. A. Bubnenkov, thinks that recently trade has been "feverish" because of the fact that the volumes of orders are not coordinated throughout the country. In his opinion, all problems come from this--shortage, overproduction, and failure to satisfy the demand.

"A couple of years ago," he says, "we went to the trade fairs knowing how much each region would take and the wholesale bases were oriented toward this. But for 1983-1984 we miscalculated: that which we thought we would sell remained unsold--rakes, hoes, small instruments, hothouses and looseners. In a word, that which was in short supply until quite recently. Thus Roskhozorg alone has 65 bases but there are no centralized purchases. Only items in short supply are distributed centrally--choppers, scythes, sickles and garden shears. With all the rest of it it is everybody for himself, each in his own way.

"In going to the trade fair not a single republic knows what the next one will be exhibiting. The production of garden and orchard equipment is being

actively assimilated in all regions and republics. And here is what is happening: there will be an insufficient amount of some particular commodity. Everyone will throw themselves into mastering its production, and at the next trade fair there will be a surplus. Production is curtailed, and at the next trade fair there are none at all. When something goes wrong, they start all over again.... The plant took 2-3 years to assimilate production and acquire equipment, and now it does not know where to sell it and is shutting down production. But the Ukraine is curtailing production without knowing that Belorussia will curtail it as well.

Quite recently there was a shortage of spades. And suddenly the purchases dropped sharply: the plan for interrepublic deliveries decreased from 22 million for 1983 to 17 million in 1985. It turned out that at the time when there were not enough spades the local agencies gave an assignment to plants of local industry to produce them, and as many as possible! These assignments and the volumes of output were not coordinated with trade. And they were produced. Trade discovered approximately 40 of these plants in the RSFSR alone. As a result, the traditional suppliers of spades were unable to sell their products, although they produce spades in a good assortment and the quality is better than that of the ones produced in local industry plants. And where did these "underground" plants get the steel, from what other purposes did they take it away? After all, metal is in short supply. For the spades they used completely the wrong kind of steel, they did not do the heat processing, and the supply of poor-quality spades was created. The residuals of these in the trade bases by the beginning of 1985 exceeded 12 million. And as a result the one who suffers is the consumer, who cannot find an acceptable spade...."

In Rozkhozorg they see the solution in concluding agreements for delivery only with enterprises assigned by Gosstab. But local agencies are against this since they are interested in expanding the production of goods that are in mass demand in their region.

And so the ministries and departments that are concerned about the output of simple instruments are looking for a common language with trade, which does not know where or how much of these products can be sold. In spite of these many years of searching, millions of people who raise potatoes and vegetables cannot be confident that they will be able to purchase a good spade at any time without any special difficulties.

Would it not be simpler to raise horses?

Even more surprising stories originate with "minor" mechanization of agricultural labor. Within the head department of the Soyuztekhpromavtomatizatsiya VPO there is the Mekhinstrument NPO, and as part of this—the GSKB for orchard and gardening equipment in Pavlovo-na-Oke in Gorkiy Oblast. Many letters arrive here from gardeners and orchard raisers. Here is one of them:

"There are plenty of garden and orchard societies in the country. But the whole problem is that we are older people and it is difficult to dig up these plots of land with a simple spade, but we have horses and in the rayon center

there are two or three per 30,000 residents. How can they think about minor mechanization and replacing the spade with some sort of mechanical aggregate? We are all crazy from high speeds and motors, but to cultivate a small plot is the entire problem. We need assistance: we need something quiet, but durable in order to facilitate our labor. We can place no hopes in horses, since there are fewer and fewer of them each year. All our hopes are in muscle power. But how do we use it so that while spending less time we gain an advantage in power?"

The author of the letter suggests his own design and asks for help with the calculations. Inventors are sending many designs like this to the GSKB in Pavlovo. This tells of the great need for means of minor mechanization. Let us leave the question of minitractors, or as they are officially called, "motor blocks," to the side. These are produced by several plants and they have appeared for sale, but neither with respect to price nor with respect to their sizes can they claim to be a mass support. We need first and foremost a universal, light mechanized instrument that is easy to operate and can be acquired at a reasonable price. You will not find one for sale, although they were created long ago. But they are no mini-engines and it is not clear what trade thinks of mechanized instruments. Orders have been sent from the GSKB in Pavlova to the USSR Ministry of Trade as early as July 1974. They suggested an instrument driven by an internal combustion engine (DVS) and with an electric drive. It is a promising business and the price will not scare people away: to be sure, it is calculated very roughly, but with a set of working parts such an instrument will cost about 80 rubles.

"Give us an experimental batch and then we shall see," answers Trade. But in order to produce an experimental batch, to show the instrument to trade and to solve the problem of the price and the volume of demand, engines are needed. And these cannot be obtained without coordinating the technical applicability. In order to have a clearer idea of what this is, let us cite one document. It was sent from the GSKB in Pavlova to the USSR State Committee for Science and Technology, the Gostandart and the Gosnab as early as 1982.

"When developing a mechanized garden and orchard instrument great difficulties arose concerning providing batching items (DVS, electric engines, compressors, electrogenerators and so forth). We are requesting that the manufacturers and organizations for material and technical supply acquire several samples of batching items—it is necessary for us to coordinate the technical applicability. We are turning to your organization to coordinate the applicability—we must provide the results of the testing. But in order to do the testing—we need the batching items themselves....

"In spite of the fact that in GOST 2117-71 there is a special phrase: "The filled-out documents for coordinating applicability is not the basis for delivering these items," almost all the organizations make one stage of the coordination dependent upon another. Moreover, in order not to violate the GOST, the coordinating agencies look for other reasons. For example, when coordinating the application of the Druzhba engine in a set of pneumatic garden equipment, the Perm Machine-Building Plant demanded that they specify technical data which could be determined only by the organization that produced it. We do not have the necessary conditions for this and we could

not even get consultation regarding this issue, not to mention coordination for applicability. In the Volgovyatmashelektrosnabsbyt Association we were also refused batching items without coordination for applicability.

"Therefore for the normal course of startup work and testing and for the initial stage of plant testing we consider it necessary to provide purchased items in these stages without coordination for applicability and to make the corresponding additions to the GOST.

"From the Gosnab we request instructions concerning providing purchased items for organizations engaging in the development during the stage of research work, scientific research work and experimental design work without coordination since in the first stages of developments no final decisions can be made concerning the application of the purchased item...."

The "applicability" of this letter in the three state committees remained unclear since there was no response. But from many enterprises and organizations where GSKB workers went, there were responses—rejections. Therefore the mechanized instrument with the electric engine or the internal combustion engine with a set of working parts (cultivator, drill, loosener, lightweight mower, original soil cultivation instrument) exists only in the form of models.

I requested a time and motion study. "Perhaps some plant will be interested in 'pushing this through'?"—"Better not. We will be flooded by letters: Where to buy it? When will it be for sale? Why the GSKB...cannot provide for the output? And how will we answer?"

The GSKB is requesting for the new instrument an old, noisy, uneconomical *druzhba* engine because there is nothing better. The development of new internal combustion engines with 2-4 horsepower was entrusted to the NATI. The ministry of construction, road and municipal machine building has developed good electric engines that are quite suitable for these purposes. To be sure, they make them only for themselves. The Chelyabinsk Tractor Plant is prepared to make an internal combustion engine for the mechanized tools. This is for its own ministry, but it needs a guaranteed demand—somewhere around 50,000 a year. And who can guarantee such a demand now?

Buy What Is Plentiful Today

But how does one study this demand so as not to miscalculate, and who should study it? Trade, the ministries responsible for the production of these goods, the enterprises, the local agencies? It turns out that the job appears to be the same for all of them, but the approaches vary and there is no agreement.

The GSKB in Pavlova, which, like the head ministry, is responsible for studying the demand began by conducting an investigation in various regions of the country—what was in short supply where? They systematized the known supplies and developed new kinds. This was submitted to trade. But trade did not want to have anything to do with the GSKB—it needed to speak with the manufacturing enterprises and find out how many items they could give trade.

If such an enterprise was found, an experimental batch could be made only using internal resources. Previously it was permitted to exchange certain materials. Now it is necessary to order the materials and batching items right down to the smallest item. Nobody coordinates how many plans have begun to assimilate production. Perhaps there will not be enough of them, but perhaps there will also be too many.

V. L. Sukhanov, head engineer of the GSKB in Pavlova, thinks:

"For our part we are trying to create and test the best models of this equipment. In order for our developments to be realized we frequently go to sovkhoses that specialize in industrial orchard raising and gardening, and we test them there. Only after this do we give the plants the 'okay' for production, and turn over the documents and the model to show to trade. The plants begin to assimilate the item—and they return it: trade will not accept it. Yet we know for sure that there is a lack of this item and the consumers are looking for it. We have questionnaires concerning the need for each commodity. But trade is in charge of the situation...."

Obviously, trade has its own difficulties. Nothing terrible will happen if it does not accept an innovation, but if it takes a risk and does not sell them.... it is much worse. And so it is the same old song: for example, there are no items of a certain kind, and they produce 3, 5 or 10 times more, they assimilate production and as quickly as possible. A large number of plants begin to assimilate production, as they say, as if there were a fire, and in the majority of cases quality does not enter in—and the market is flooded. Trade beats a retreat: not necessary, not at all necessary. This is what happened with choppers: at the beginning of the 1970's there was a surplus of them, and now there is a shortage. It is no wonder that consumers who have learned from bitter experience: if there is an abundance of something grab hold of it, for soon it will disappear....

Yet the demand for a commodity which is appearing on a market for the first time is subject to a simple law: at first it will increase sharply, then it will decline smoothly and remain at a certain stable level. Spades and rakes are not shoes and stockings. Once the latter have gone out of fashion nobody will buy them, even when they are marked down. There is a stable demand for tools. It is simply a matter of knowing its level.... The existing statistical reporting makes it difficult to study the demand. Of these reports 40 kinds of tools, for example, are represented by 22. Ministry of Local Industry has no accounting at all for three kinds: spades, rakes and hoes. And so it turns out that on the whole according to the consolidated position everything is normal, but there is a shortage of individual items.

Now voices are ringing out more and more loudly that industry itself must study the demand for what it produces. The more so since trade cannot see beyond its own nose. It is difficult for it to study and see the future and world achievements. It can only answer the question: what is being sold out now, what is not, and then only in limited regions. It is even more difficult for trade to study the demand for innovations, especially technically complicated ones. Trade workers or even merchants from wholesale bases cannot know, for example, what the need is for mechanized tools. Here it is

necessary to have a skilled study of the market. There are frequent reproaches against the All-Union Scientific Research Institute for Studying the Demand for Consumer Goods and Market Conditions (VNIKS) of the USSR Ministry of Trade: Why have they not announced the unsatisfied demand for various commodities? Or, conversely, why have they not said that the demand is being completely met? But the VNIKS cannot include all commodities, even consolidated groups of them.

It would be difficult to assume that even the enterprises that produce garden and orchard tools will be able to determine reliably the demand in a region, not to mention the country, the more so since for them garden and orchard tools are a tertiary business and, as a rule, comprise an insignificant proportion of their overall output. Even if they make mistakes, in the overall volume of production these losses are not very great.

What kind of solution can there be here? To change trade's approach, to obtain garden and orchard tools centrally through bases, to work under orders and standards, to collect orders for innovations. This system is expedient: the most necessary things—in all the stores, so that it is not necessary to go to the end of the earth and other things—in large specialized stores like "Our Garden" which have everything, including innovations, where work can be conducted to study the demand. The need for such stores became obvious long ago, but so far there are extremely few of them. And there is no way of gathering the opinions of the consumers. There must also be changes in the organization of trade itself: now these goods are sometimes gathering dust in dark corners of farm stores. But it is difficult to find them there. The client walks past them and does not know that this is a leading innovation, and behind a pile of boxes...it is necessary to have advertising for new goods—posters that explain what they are and what they are for. And it is even better to demonstrate an innovation, especially a mechanized one, on a little clump of land somewhere right near the store.

Where It Is Empty and Where It Is Crowded

The lack of various kinds of garden and orchard tools for sale is explained largely by the lack of uniformity in their production. Certain items are produced in batches of 2,000-4,000 so that they cannot even be counted. But when the output volume is more significant, say, around 30,000, if the same kind of tool is produced at one or two plants, there are not enough for the entire country and it is not advantageous to ship these items very far.

In the SKB in Pavlova there is a map on which pins mark what is produced where. The symbols on the map merge into the figure of a dragon which has a heavy head and paws, and the massive torso covers the Baltic Republics, Belorussia, the Ukraine, the Center and South of European Russia, and the long, sharply narrowing tail extends along the south of Siberia and Kazakhstan toward the Far East.... The impression is reinforced by the figures. Most of the tools are produced in the RSFSR—60 percent (371 enterprises), the Ukraine 21 percent (131), and the Baltic Republic. At the end of the list are Azerbaijan, Armenia and Turkmenia, which produce less than 1 percent altogether, although gardening and viniculture are developing here too. Little is produced in Siberia and the Far East. Such a large oblast as

Novosibirsk produces only rakes, spades, looseners, hoes, watering cans, carts and pumps, and also handles.

The head engineer of the SKB in Pavlova, V. L. Sukhanov:

"We think that we need large specialized plants or shops at large enterprises because only with well-arranged production and with large batches is it possible to achieve high quality. And if the plant is to produce not one, but an entire set of items as, for example, the Tallinn Vazar Association of the Estonian SSR Ministry of Local Industry does (it makes about 20 kinds of soil cultivation tools and four different kinds of rakes), it will be easier to maneuver production to arrange for the output of innovations and to satisfy the demands of the market. But what happens instead? Large suppliers reduce their output and then everywhere there are small and extremely small little plants and shops with a production of 2,000-3,000 items a year....

One must add to what has been said that in order to satisfy the demand it is necessary to have a broad and diversified assortment. And enterprises for which these products are not the main ones are certainly not oriented toward this approach. They are looking for the simplest and in the largest volume, and for many years. But trade is not ordering large volumes now: the demand has been satisfied for the basic kinds of items. There are enterprises that produce small batches, but there is no coordination among them—you produce pitchforks of this kind and I will produce the others. Therefore thousands of necessary small items are missing from the stores.

The Rake on the Other Side of the Fence

In order to see how garden and orchard tools are produced we selected enterprises at Leningrad where the volume of their output is fairly high.

The plant instruction machines, in addition to its main products, produces only goods for gardeners and orchard growers—two kinds of ordinary rakes, large and small fan rakes and looseners totaling a sum of 440,000 rubles. This is about 5 percent of the production volume. The plant's director, N. M. Lyzo, discusses the problems with producing these:

"Our products are in demand, especially the fan rakes. Perhaps you have noticed in the film entitled "Seventeen Moments in Spring" Shtirlits is cleaning up his front yard with our rakes. Production is increasing rapidly, but it is so difficult! The plant is old and there is a plan for reconstruction but so far we are producing goods for the people in a makeshift hut. One cannot bring oneself to call it a shop. The suppliers are cool toward this product. We receive the belt steel and the cold rolled sheets with interruptions. It is now June and our supplies for the first and second quarters have not been sold. Handles are also a problem, even though there are forests all around the city. The bobbin factory which is our supplier has changed over to plastic, and we have not been assigned another one, so we have to dig up our own supplies. You can see the conditions under which we produce these rakes...."

Indeed, when looking at the section for consumer goods it is difficult to believe that this is one of the large productions of garden tools in such a city as Leningrad. The section is smaller than a school classroom, and behind the door, on a tiny little area they do the drying and painting. The ventilation is poor and the machine tools are crowded so close together that not only can one not pass through on an electric car, but it is even difficult for a portly person to walk through there. The head engineer, Z. B. Fuksov, drew my attention to the automated machine for cutting the metal strips.

"This is simple equipment, but they do not produce it. We manufactured it ourselves. We do not want to wait for the reconstruction and want to modernize the section through our own forces. We shall increase the areas, start up the painting line and then it will be possible to expand production. We shall put a mechanized line into operation and reduce manual labor. But for the time being we have to move the 15-kilogram stands with installed instruments for painting with our own hands. So far our fan rakes are unprofitable: the wholesale price is 1 ruble, 93 kopecks, and the retail price—1 ruble, 70 kopecks...."

The Machine Tool-Building Association imeni Ya. M. Sverdlov produces a set of flower-planting tools, the Tyulpan, in an amount of 150,000 rubles a year, and the total value of consumer goods is 1.1 million rubles. The deputy head technologist, I. A. Shcherba, notes:

"We have to take care of our own equipment. Through our own forces we intend to automate the polishing, smoothing and cleaning—which are labor-intensive operations which are now performed by women. It is difficult to deliver materials for satisfying popular demand. Our Tyulpan looks good there also because of its attractive packaging—a Finnish box. Where do we get them? This can only be whispered from one supplier to another...."

The experimental plant of the Mekhanobr SKB produces vorticle pumps. The chief of the SKB, Ye. P. Kapralov, says:

"Our pumps sell like hotcakes. We take them directly to the store and within a couple of hours they are gone. We have increased the production volume from 5,000 to 15,000 rubles' worth and our bold plans are to even double this. But this is still just a drop in the bucket: 400 pumps a year and trade is asking for a thousand. It is difficult to increase production: first, the plant is old, and second, in terms of its size it is nothing like the Putilovskiy.... None of the conditions for producing consumer goods exist. It is crowded and we do the testing in a sink—we open up the faucet and test. The production is fairly complicated and is entrusted to highly skilled workers. But the main thing, I think, is that we cannot load the capacities of this experimental plant with consumer goods. After all, our main task is to create and test models of mining equipment. And instead of producing a new experimental installation, we are producing pumps. We are still not making any significant difference with them. The demand for them is great and we should not try to make do with half-measures but select a plant that is suitable for their production, start up a flow line and make a technological line. Then it would be possible to end the shortage and cut the production cost. Here it is 15-20 percent higher; it was 40 percent higher. Is this really the state approach?"

With these words I should like to conclude this section. Alas, at many plants the consumer goods sections are extremely small, they produce little, and the production of garden and orchard tools, and in a broad assortment as well, is disadvantageous for the enterprises. The labor-intensiveness and production costs are high, the proportion of manual labor is great, and the equipment, as a rule, is old and not very productive and it is difficult to get hold of it. Under these conditions it is difficult to count on having the enterprises respond willingly and begin to assimilate the production of this equipment rapidly. Moreover difficulties with the metal and other materials squelch any desire to gratify the gardeners with miraculous innovations....

And so, a person who wishes to raise his own potatoes, vegetables, berries and fruits must be ready to cut without a scythe or sickle, to dig without a spade, and to water without a watering bucket. And millions of people with these plots of land are much more enterprising than the managers of departments, enterprises and trade organizations. These people are working persistently, remaking tools they have purchased so that they can be used conveniently, inventing new ones, and putting together even homemade minitractors. They react sensitively to all the advice in the magazines and newspapers and instantly adopt positive experience. But, unfortunately, their enterprisingness is developing with the accompaniment of long years of discussions to the effect that it would be good to turn industry and trade in the direction of the needs of the consumer, that it would be good to bring the inventions and developments of designers, both professional and nonprofessional, to the stores so there it would be possible to purchase what one has heard about somewhere, seen somewhere or read about somewhere. But they have not held them in their hands or used them on their plot. But it would seem that the organizers of scientific and technical progress have more serious concerns than any lever on a spade which helps a pensioner to work with youthful zeal, than a microengine which helps to replace the horses which have disappeared.... So far the press is suggesting, for example, instead of using the heavy and costly lawnmowers, to make more convenient ones out of...electric floor polishers. In general this is a do-it-yourself matter....

We are now on the threshold of the "garden boom": a decision has been made to give the population more than a million plots each year. In order for the gardeners not to be left empty-handed and to receive not only good traditional implements, but also effective innovations, including mechanized ones, we suggest arranging at the Exhibition of the Achievements of the USSR National Economy a review exhibit of original designs of garden and orchard tools where both professionals and amateurs could send their developments. The best developments, which are distinguished with diplomas and incentives, with the participation of the Ministry of Agricultural Machine Building and the GSKB in Pavlova, would be distributed among the enterprises, many of which are now persistently looking for models of consumer goods for production. The Soyuzpromvnedreniye VPO could be of assistance here. It would also be worthwhile to listen to the opinion of specialists concerning the creation of specialized enterprises in all regions for producing gardening tools following the example of the Tallinn Vazar Association of the Estonian SSR Ministry of Local Industry. Such enterprises could study the market demand, react more flexibly to the requests of the consumers, and respond to everything that is

new. Everywhere we need good firm stores that are located in special premises where it would be possible to demonstrate innovations to the consumers and study the demand for them. It is important as soon as possible to arrange for the output of mechanized tools that are light and convenient with various types of engines and a broad range of working adapters. Possibly then the labor of millions of people in the gardens and orchards will not only be useful and advantageous, but also pleasant. But so far the amateur gardeners can only dream that scientific and technical progress will not bypass those little sections where there are record harvests per hectare and where the problems are no less difficult than on the immense fields.

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IMPORTANCE OF SOUND PRICE SYSTEM STRESSED

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[Article by N. I. Chekhlov, candidate of economic sciences, chief of the general economics division of the USSR State Committee for Prices (Moscow): "Prices and Tariffs in Industry"]

[Text] The Basic Directions for the Economic and Social Development of the USSR During 1986-1990 and the Period Up to the Year 2000 note the need to improve the system of prices and to reflect more fully in them the qualitative indicators of production and the level of socially necessary expenditures of labor.

A large step in the improvement of wholesale prices and tariffs in industry was their general revision on 1 January 1982, during the course of which there was qualitative development of the principles of forming prices which were established in 1967. In order to reflect more fully the socially necessary expenditures on the products, the prices include a larger amount of expenditures on reproduction of the labor force, prospecting for minerals and reproduction of timber resources. The tariffs for contributions for social security were increased 1.8-fold and in the majority of branches they were set in the amount of 14 percent. New rates were developed and approved for making reimbursement for expenditures on geological prospecting work in the petroleum processing, gas and iron ore industry, nonferrous metallurgy and a number of other branches. Expenditures on geological prospecting are taken into account in the production cost of 60 minerals as compared to 25 minerals in the previously existing prices. The payment by stump has been doubled. As a result, the new prices take into account all state expenditures on forestry and 80 percent of the expenditures on geological prospecting. State subsidies for covering expenditures for social security have been reduced significantly. Payment for water taken from the water management systems has also been introduced.

Methods of forming normatives of profitability have also been further developed. For the various groups of products of the processing branches they have been established at the ratio between profit and the production cost minus the cost of the implements of labor that are used. This policy for determining profitability objectively reduces the motivation of the

enterprises to produce material-intensive products and, consequently, is directed toward economizing on resources. The normatives of profitability for extracting petroleum and casing head gas, production of gas processing products, mining chemistry, mineral fertilizers, natural and synthetic rubber, tires and other products have been determined as the ratio between profit and fixed capital, that is, on the basis of the proportional capital-intensiveness of the products.

The new prices take into account more fully the consumer properties and the effectiveness of the products, which has brought about greater differentiation of profitability normatives for concrete kinds of products, depending on their effectiveness and quality, degree of plant readiness, technological suitability and so forth.

The territorial differentiation of prices and the price ratios for interchangeable kinds of products, mainly coal, gas and fuel oil, have also been improved.

When the new prices were developed the objective changes in the conditions for the production and sale of products were taken into account. Prices for products of the coal industry were increased by 43.7 percent, petroleum—2.2-fold, gas—28 percent, ferrous metallurgy—22.5 percent, nonferrous metallurgy—36.5 percent, timber procurements—34 percent, the pulp and paper industry—30 percent, and construction materials—22 percent. At the same time prices were reduced for a number of kinds of products of machine building and the chemical and radioelectronic industry. Thus wholesale prices and tariffs in industry like other kinds of prices are not a static system.

Under the conditions of the new prices in industry as a whole the profitability in 1983 was 16.2 percent of the production cost and 12.4 percent of the production capital, the profit amounted to 94 billion rubles, and the turnover tax was 103 billion rubles.

An analysis of the hypothesis for the development of the national economy under the 12th Five-Year Plan shows that the prices and rates introduced in industry beginning on 1 January 1982 can be retained on the whole during 1986-1990. In order to create conditions for strengthening cost accounting [khozraschet] individual corrections have been made in the existing prices. Prices have been increased for certain kinds of products that are produced at a loss in ferrous metallurgy, heavy and energy machine building, and the electrical equipment and chemical industry. At the same time prices have been reduced for a number of highly profitable kinds of products.

In the coal industry, in spite of the fact that the wholesale prices for its products were considerably increased after 1 January 1982, providing for profitable operation of the branch, the extraction of coal by the underground method remained unprofitable, although the losses were reduced significantly. This is explained to a certain degree by the deterioration of mining and geological conditions, the increased depth of the working, the working of beds with high ash content, and also the fact that in the new prices they did not manage to take into account the fact that the wages for workers in the coal industry were increased starting in 1981. But a special reason for the

unprofitable work after the price increase is the deterioration of the utilization of production capacities and labor resources here, the deterioration of the quality of the coal as a result of slow introduction of advanced technology for extraction, the extraction along with the coal of a large quantity of empty rock, the inadequate volumes of enrichment of coal, and also the slow increase in the production of the promising eastern regions of the country where the cost of extraction of coal is one-sixth to one-eighth the amount it is in the Donbass.

In order to provide for stability of the existing price system and to create cost-accounting conditions for the operation of the coal industry while retaining the existing prices for coal for consumers, beginning on 1 January 1986 calculated prices were introduced for coal mining and enriching enterprises which will make up for the planned normative expenditures on the extraction and enrichment of coals.

A most important direction for further improving price setting is to increase the role of prices in accelerating scientific and technical progress. Recently prices have had a stronger influence on the selection of the most effective technical decisions, for which the policy has been changed for the development of limit prices, which should be determined taking into account the economic effect of the new products as well as the expected expenditures on their production. This forces the creators of new technical equipment, even in the stage of designing it, to be concerned about reducing expenditures and the resource-intensiveness of the new products and at the same time about increasing their effectiveness and quality.

It will be given the "green light" for production only if the level of the limit prices turns out to be no less than 15 percent lower than the upper limit of prices formed taking into account the economic effect of the products. Moreover, this effect is the basis for calculating the increments to the prices for new items, which are determined at the same time as the limit prices. Thus for the EKG-15 excavator that is being developed the USSR State Committee for Prices has registered a limit price in the amount of 780,000 rubles and at the same time set an increment to it in the amount of 155,000 rubles.

As experience has shown, the formation of limit prices solely on the basis of the calculated effect of the product has caused the developers to pay less attention to making the products less expensive to produce. The unreliability of the existing methods for determining the expected effect of the items and the existing possibility of exaggerating it have frequently led to the establishment of unjustifiably high limit prices and, as a result, a growth of wholesale prices.

Price-setting agencies have also taken measures directed toward the creation of more favorable economic conditions for enterprises during the period of the assimilation of new technical equipment. To this end wholesale prices for new products have begun to be established taking into account reimbursement for all economically justified planned expenditures (minus expenditures that are reimbursed from the unified funds for the development of science and technology) made during the first year of the production of the new products.

And the normative of profitability for the new products is taken at the level of the one for analogous items at the given enterprise.

These changes in the methods of forming prices were dictated to a considerable degree by the need to weaken the negative influence on the collectives who were assimilating new products and the shortcomings in planning, financing and economic incentives for the production collectives. One of these shortcomings is the limited amount of the unified fund for the development of science and technology, which does not make it possible to compensate fully for the increased expenditures during the first years of the assimilation of the technical equipment.

But one should keep in mind that the new aspects of the establishment of prices do not violate one of the principles of price setting—that the new product should be relatively less expensive. This principle is clearly registered in the new normative documents and is maintained in practice. The highest expenditures during the first year of the assimilation of products can be accepted only if the prices for the new items established on the basis of these in addition to the increment to these prices is lower than for the product being replaced as calculated per unit of useful effect.

The policy that has been adopted slows up the rates of reduction of prices for new products to a certain degree. The relatively rapid increase in the profitability of new products as a result of reducing the production cost (which is especially appreciable during the first years when the product is being produced) can weaken the attention paid by producers to streamline production and also the warning signals for developing new items since the products being produced will be highly profitable. All these aspects are kept in mind by the price-setting agencies. The latter are constantly analyzing the consequences of applying the adopted policy for establishing prices and, taking all circumstances into account, make the necessary refinements and changes.

In order to strengthen the economic motivation of the planning and design organizations, associations and enterprises to increase the effectiveness and improve the quality of products, the maximum amount of increments to prices has been increased to 30 percent.

During the first half of 1984 alone the USSR State Committee for Prices approved more than 3,000 increments to wholesale prices for new and modernized products. Moreover the average amount of the increments amounted to 10 percent of the price, which is almost 3 times as much as in 1979. Increments in an amount of up to 30 percent of wholesale prices were established for new industrial robots, energy steam boilers, pipe-welding equipment, turbo and hydro generators with large capacities, electrothermal furnaces, modern automated machine tool and forge-press equipment, and so forth.

The sum of the established increments already amounts to more than half a billion rubles a year. Moreover, 30 percent of the sum of the increments go into the economic incentive funds for developers and creators of new technical equipment.

In places where they seriously work on new technical equipment payments from increments to prices exert a real influence on the economic interests of the participants in public production. Thus during 9 months of 1984 the increments added to the prices of products at enterprises of Zaporozhtransformator amounted to about 2 million rubles. Of this sum almost 600,000 rubles went into the economic incentive fund, including 350,000 rubles into the material incentive fund.

Not only increasing the maximum amount of increments to prices, but also the improvement of the mechanism for their distribution was directed toward providing incentives for the latest, most effective products. If on the whole for the product it is envisioned that one take into account in the increments up to 50 percent of the economic effect, for products its production is based on developments that are recognized as inventions and also those that are manufactured to replace imported items and for industrial robots it is 70 percent.

When establishing prices and increments to them we have begun to take into account more fully the constituent parts of the national economic effect of new products, including those that appear in the improvement of the working conditions for workers, protection of the environment, and more efficient utilization of natural resources. In the event that with respect to these areas it is difficult or still impossible to give a quantitative evaluation of the effect, the incentive increment is established in a fixed amount.

In order to strengthen the influence of prices on updating production, the practice of establishing rebates from prices for obsolete products has become widespread. The maximum amount of the applied rebates has been increased significantly (up to 30 percent of the wholesale price). The USSR State Committee for Prices has established rebates from prices for all outdated technical equipment that is to be removed from production in keeping with assignments of the State Plan for the Economic and Social Development of the USSR for 1984, and also from the complete list of the corresponding branch plans. Moreover, as machines, equipment and instruments are recertified in keeping with the new policy for certification of industrial products, rebates will be applied from wholesale prices for items that are not included in the highest and the first quality categories.

Certain steps have been taken in the direction of special-purpose incentives for reducing the production cost of products that are being assimilated. At the present time all the savings from reducing material-intensiveness and labor-intensiveness are taken into account in the price of the new products as additional profit for the manufacturing enterprise.

As a result of the measures taken in 1983 the total profitability of new items has begun to exceed the profitability of the previously assimilated products. But here one should obviously take into account the fact that these measures do not remove the economic barriers that stand in the way of assimilating new technical equipment. The fact is that this process is frequently accompanied by a reduction for a certain period of the volumes of production that have been achieved and by an increase in nonproductive expenditures. All this leads to a reduction of the mass of profit even if the profitability of the

new items is no less than that of the products that were previously produced. Understandably, these losses cannot be compensated for with the help of prices since this would lead, as a rule, to making the products more expensive and making them disadvantageous as compared to the old ones.

It seems to us that this problem should be solved by means of compensation funds of the enterprises from deductions of part of the profit from items that are produced, increments to prices, granting the collectives special credit, and other measures.

Experience shows that additional economic incentives are not being utilized fully so far. This is shown, in particular, by the fact that in 1984 the maximum increments in the amount of 30 percent of the price were approved by the USSR State Committee for Prices only for wholesale prices for 197 items. And the economic effect, which is the source of the formation of increments to prices for the rest of the items, turned out to be inadequate to establish high incentive increments.

This is related first and foremost to the fact that the technical and economic parameters of many items that have been put into production do not differ essentially from those of products that are already being produced and do not correspond to the established assignments. This pertains especially to such an extremely important indicator as the productivity of machines and equipment. For many kinds of technical equipment they do not confirm in operation the parameters envisioned in the normative and technical documentation, according to which the price level is determined, which causes harm to the national economy and worsens the cost accounting indicators of the consumer enterprises. The utilization even of recently designed powerful equipment which has turned out to be unreliable and has been repeatedly modernized has also sometimes led to these results. Because of the poor quality of certain items the State Committee for Prices has been forced to abolish the previously established increment to their prices.

We are also concerned about the fact that individual technical innovations not only do not provide for a savings for the national economy, but even lead to an increase in the material-intensiveness of the products and, in the final analysis, to an increase in the total expenditures in the national economy. These are precisely the consequences that can result from changing over to producing trucks with diesel engines at the Moscow Automotive Plant imeni Likhachev and the Gorkiy Automotive Plant if measures are not taken to reduce the planned expenditures on the production of these products.

Analysis shows that among the significant factors increasing the cost of new technical equipment are the slow rates of its assimilation and the chronic significant underloading of capacities intended for their manufacture. Thus at the Cheboksary Plant for Industrial Tractors where the output of tractors has been assimilated for over 8 years, up until recently the capacities have been utilized only by 16 percent. As a result of this the production cost of tractors exceeds the planned cost 3-4-fold. The incomplete assimilation of the production capacities of new plants slows up the achievement of the planned production cost for their products. Analogous shortcomings exist in a number of cases with the utilization of imported equipment as well and with

the organization of production with purchased licenses. Thus the production of electromagnetic starters based on highly productive imported equipment was organized unsatisfactorily by the Ministry of the Electrical Equipment Industry. Although the assimilation of the planned capacities was earmarked for 1979, at the present time the output of the starters amounts to only 40 percent of the planned volume, which has led to losses in production of more than 18 million rubles.

When assimilating new products the enterprises frequently utilize material resources inefficiently, have low coefficients of the utilization of metal, allow above-normative labor expenditures, and load costly equipment poorly, and, as a result, the plans for wholesale prices are unjustifiably increased.

Both in designing new technical equipment and delivering it to production we are not comprehensively solving problems of providing for the manufacture and delivery of batching items and materials, which also leads to increasing the cost of the products.

At the present time the consumers of new technical equipment do not bear the proper economic responsibility for the level of the prices coordinated with them and the amount of the economic effect. This is one of the reasons for the increased costs of products and the increased plans for prices and data for substantiating them. For example, for the figures 1400 machine tool (manufacturer—Uralsmash PO) for the Karaganda Metallurgical Combine in the first stage the economic effect was determined at 109.8 million rubles. As a result of an expert evaluation by the USSR State Committee for Prices that figure was reduced to 34.6 million rubles.

Incentives for reducing the material-intensiveness of products are not being fully utilized. In order to provide an economic incentive for reducing the material-intensiveness of paper and cardboard while maintaining or improving their main technical and economic parameters, there was a changeover to an effective unit of measurement—the mass of 1,000 square meters. A reduction of the average mass of a square meter of newsprint by 1 gram reduces its production cost by 1 percent. But in order to motivate the producers, the wholesale prices per unit of area of paper is not reduced when its mass decreases, and in some cases it is even increased. Thus for newsprint weighing 45 grams per square meter the prices per 1,000 square meters are 5 percent higher than for this paper weighing 51 grams per square meter. A system of incentive increments to wholesale prices has also been introduced for reducing the mass of a square meter and rebates for increasing the mass (within the limits of the allowances envisioned by the standard). But in spite of the existence of technical specifications and approved wholesale prices that stimulate the output of newsprint weighing 45 grams per square meter, almost one-third of it continues to be produced with a mass of 51 grams per square meter.

Recently the enterprises' interest in the output of new items has been increased primarily as a result of increasing the profitability of new items and expanding the practice of establishing increments to prices and increasing their amounts. But this does not always involve the interests of those who are updating production. Therefore it seems to us that we should create an

effective system of economic coercion including with the help of prices and the removal of obsolete products from production. The utilization of new, advanced experience should be not a privilege, but an economic necessity for each production collective. An important role in this matter should be played by further expansion of the practice of establishing rebates from prices for obsolete products. We should also envision in the plans assignments for reducing the prices of the most important kinds of products.

These measures would contribute to retarding the growth of prices and to ensuring that the production of new items would be more advantageous than old ones with a lower price level.

Obviously, when determining the level of prices and increments to them one should be oriented more toward the real conditions for consumption of the product and their actual return, which will simultaneously contribute to greater correspondence between the production structure and the structure of public needs. It seems necessary to establish rebates from existing prices (or to revise them if the economic and social effect of the products calculated in the stage of development and organization of production are not confirmed in operation. Here the rebates should be envisioned both in the event of a lack of correspondence between the actual data for the products and the indicators envisioned in the normative and technical documentation and with incomplete delivery of products, without the corresponding selection of trailer and other implements, which leads to incomplete and inefficient utilization of machines and equipment. This is precisely the state of affairs that exists with the operation of powerful K-700 tractors because of the fact that until recently the Ministry of Agricultural Machine Building has not provided for delivery to the consumers of the necessary quantity of trailers and implements to be mounted on these tractors.

It is also necessary to increase the economic and other responsibility of the consumers for realizing the economic effect.

The stimulating role of prices is manifested through the planning assignments, the criteria for evaluating the operation of associations and enterprises, the policy for distributing the created net income and the system of material incentives. These units, when their actions are coordinated, can weaken the stimulating role of prices which, unfortunately, does take place. It is no accident, for example, that the increments to prices, because of their immediate link with the economic incentive funds, exert a deeper influence on the producers than does the actual price level itself and the amount of net income included in it.

In this connection it seems necessary to establish a closer dependency between the level of prices, the rebates from them, the product, the mass of profit, and the economic incentive funds. It would be expedient to increase these funds with a higher actual profitability of the products as compared to the normative in the event of the reduction of prices during the planned period, and also to reduce the amount of profit left at the disposal of the enterprises in a particular proportion of the rebates from the prices.

Establishing progressive norms for deductions of profit into the budget and correspondingly reducing the profit left at the disposal of the enterprise as the time period for the output of the assimilated products and their obsolescence increases would contribute to strengthening the motivation of the enterprises to assimilate new technical equipment.

An increase in the role of prices as an instrument of the party economic policy predetermines the need for their further comprehensive development and improvement. In the future it will be necessary to concentrate basic attention on stabilizing and subsequently reducing wholesale prices per unit of consumer value. The reflection in the prices of the savings on working time by means of reducing them is the most natural and economically objective reflection of the law of continuing growth of labor productivity.

At the same time the policy of reducing prices motivates production collectives and economic and planning agencies to devote more attention to streamlining production and reducing production costs. Price reduction creates real prerequisites for siphoning cost accounting, increasing the balance among material-substantial and value indicators, and strengthening the exchange rate of the ruble.

The recent increase in wholesale prices and individual transportation tariffs has started a whole chain reaction of price increases throughout the entire national economy, has caused strain in the price system, and has increased expenditures for the production of many kinds of consumer goods. One should also keep in mind the ever greater influence of wholesale prices on expenditures on the kolkhozes and sovkhoses because of the industrialization of agricultural production.

Increasing prices worsens many proportions and indicators of the development of the national economy and increases the material-intensiveness of public labor. Thus during 1977-1982 the material-intensiveness in industry in comparable prices decreased by 0.4 percent while in current prices it increased by 0.6 percent. In construction during this period this indicator decreased by 1.1 percent in comparable prices and increased by 1.3 percent in current prices.

Practice has shown the lack of justification for the presumption that increasing prices will contribute to economizing on resources since a change in prices and the resulting increase in production outlays have been taken into account in the plants of the enterprises and compensated for correspondingly by the state. At the same time an increase in prices and an increase in production profitability as a result of this has weakened the attention paid by many managers and planning agencies to reducing production costs, introducing new technical equipment and technology and taking other measures for making production less expensive. For their part they have also a greater desire to increase prices as a means of obtaining cost-accounting profit with high expenditures, that is, providing for departmental and group interests at the expense of general national interests. Increasing prices has contributed to the spreading among many managers of a kind of psychology of increased cost and attempts to justify a failure to fulfill assignments for reducing production costs by referring to price increases.

The recent increase in wholesale prices was brought about not only by the effect of certain objective factors that increased prices, mainly in individual extraction branches. To a large degree this process was also linked to the deterioration of the utilization of production capital, raw materials, processed materials and labor force at many enterprises and in a number of branches as well as the freezing of material resources, the low effectiveness of the organizational and technical measures, and the regular failure to fulfill assignments for new technical equipment and technology.

During the course of the work for revising drafts of prices in price-setting agencies, analyzing prices and checking on their application, large production reserves are revealed.

Production capacities are being assimilated slowly and raw materials are being utilized inefficiently at enterprises of the Ministry of the Chemical Industry. In 1983 the capacities for producing refrigerants were assimilated by 35 percent at the Yavan Electrochemical Plant and 25 percent at the Volgograd Kaustik Association, and the production cost exceeded the planned amount 3-fold and 2-fold, respectively. Less than one-fourth of the capacities for reducing polystyrene were assimilated at the Shevchenko and Omsk plastic plants. Capacities for producing benzene, propylene and polyethylene are being utilized unsatisfactorily at the Priiskitskiy Plastics Plant. The capacities for producing furfural introduced at the Manturovskiy Biochemical Plant in 1979 are being utilized by only 24.4 percent because of mistakes in the plan for the plant, the lack of the required raw material base and purification installations, and so forth. In the country as a whole the overall sum of the increase in the cost of prices for newly introduced capacities as compared to the plans amounts to more than 5 billion rubles.

Expenditures are unjustifiably high in the production of a number of construction materials because of shortcomings in the organization of production and the backward technology. Thus the output of reinforced concrete was organized at 5,000 enterprises of various ministries and departments which are not taking the proper measures for the development of specialization and cooperation of production. Because of this frequently the quantity of type sizes reaches 1,000 at one enterprise, which leads to frequent readjustments of equipment, inefficient utilization of it, and increased production costs. About 40 percent of the reinforced concrete is produced at small enterprises.

The production of prestressed reinforced concrete is developing extremely slowly, and the use of this reduces the expenditure of metal significantly. There are large shortcomings in the production of brick, the production cost of which increased by 14 percent during 1981-1983, as a result of which this kind of product became unprofitable in the majority of cases.

A large reserve for reducing the expenditure of fuel in the country and reducing operational expenditures can be found in reducing the production of thermal and electric energy with departmental boilers and small electric power stations. Thus the production cost of electric energy at small departmental electric power stations exceeds 7-8-fold the average expenditures on the

production of electric energy and the USSR Ministry of Power and Electrification.

The shortcomings in the assimilation of new production capacities and the increased production costs caused by this as compared to the planning indicators, the failure to fulfill production plans, the inefficient utilization of material resources, and the application of outdated reduced norms and normatives constitute the main reason for losses and various levels of profitability in the production of individual kinds of products. This process is also influenced essentially by the existence of a large number of relatively small enterprises with a low level of production at which expenditures per unit of output significantly exceed the average branch level which is accepted when establishing wholesale prices. Thus expenditures on the production of ammonium from natural gas at the worst enterprises are almost 4 times the average expenditures, and at the best enterprises individual expenditures are 30 percent lower than the base average expenditures. Because of this the profitability of production (with respect to the production costs) of these products at individual enterprises ranges from -69 percent (loss) to +75 percent.

Frequently products are produced at a loss at the enterprises when on the whole the given kind of item is sufficiently profitable and at the best enterprises its production produces an additional profit. Therefore the conditions for the development of cost-accounting relations should be provided not as a result of increasing prices, but through technical reequipment of enterprises, the introduction of technical equipment and technology, complete assimilation of production capacities, greater economy, and the output of more effective and higher quality products for which, as a rule, the price-setting agencies have established higher normatives of profitability. Thus the startup of an installation for tempering rails at the Azovstal Plant provided for an increase of about 15 percent in the profitability of production. The assimilation of highly durable pipes at the Azerbaijan Pipe-Rolling Plant made it possible to eliminate losses in the production of this kind of product and essentially increase the profitability of the enterprise as a whole.

Increasing expenditures for the extraction of individual kinds of fuel and raw material has an essential influence on the dynamics of the prices. In a number of cases this will obviously continue in the future. Therefore it is important to neutralize this process as a result of the development and introduction of a complex of new machines and also as a result of economizing on fuel and raw material resources in consumption.

As analysis shows, the price increases in the past, in a number of cases, took place not because of changes in the actual expenditure of material resources and the labor-intensiveness of the items, but as a result of the changes in the methods for calculating the production cost, an increase in the norms for amortization deductions, and the introduction of payments for resources. Moreover, the inclusion in the production cost of new items of expenditures was not accompanied by a corresponding reduction of the amount of net income included in the prices. The planned profitability in comparison to the capital was not reduced also because of the reduction of the output-capital ratio, which has amounted to almost 30 percent during the past 20 years.

In our opinion, the orientation toward expanding the economic independence of the production collectives and the changeover to simple reproduction with internal accumulations cannot be a justification for increasing prices.

This process can be basically carried out through redistribution of net income between the state and the ministries since not only for industry as a whole, but also for the absolute majority of its branches the profit included in the prices in combination with amortization deductions significantly exceeds the amounts of capital investments. And in industry the former is twice as great.

During the course of preparing for and conducting work for comprehensive improvement of prices it would obviously be expedient to consider questions of the optimal level and the ratio of prices for interchangeable kinds of products. On this plane it is important to improve the ratios among prices for various kinds of fuel and design and construction materials.

It will obviously be necessary to refine the model of prices, their structure, the methods of determining the normatives of profitability and their differentiation at the branch level and for the various individual kinds of products. It is no less important to improve the formation of the production cost as the basis for prices and the justification and quantitative definition of all norms and normatives that are utilized when establishing prices.

One should obviously consider strengthening the link between prices and planning to be one of the directions for improving prices. Prices should be increasingly formed taking into account national economic proportions and their overall revision should be carried out within time periods that provide for the development of plans in new prices. Further improvement of price setting is predetermined by the implementation of the large-scale economic experiment in industry and the orientation toward expanding the rights and responsibilities of production collectives.

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URBANIZATION IN KUZBASS AREA EXAMINED

Novosibirsk *EKONOMIKA I ORGANIZATSIYA PROMYSHLENNOGO PROIZVODSTVA* (EKO) in Russian No 4, Apr 86 pp 196-205

[Article by I. S. Dreytser, division chief of the Kuznetsk Branch of the Scientific Research and Planning-Design Institute for the Extraction of Minerals by the Open Pit Method (Kemerovo): "Urbanization and Man." Notes on socioeconomic problems of the cities of the Kuzbass. On the pages of our magazine we have already considered questions of the industrial development of the Kuzbass (V. E. Popov, K. M. Zvyagintseva, A. P. Kuzmin. "The Share of the Kuzbass," EKO, No 4, 1984). This time we are addressing the social problems of this region]

[Text] It is no secret that the Kuzbass is lagging behind significantly in the fulfillment of the assignments for the 10th Five-Year Plan: such indicators as the extraction of coal and labor productivity have dropped and the production cost of products has increased. These arrears have remained under the 11th Five-Year Plan. One can obviously give many reasons for the situation that has been created. But among the main ones, in our opinion, are the unsatisfactory conditions for the life of the people. They are of decisive significance in the coal industry as in no other.

Almost one-fifth of the residents of Siberia are concentrated on the territory of Kemerovo Oblast, which comprises less than 1 percent of the area of Siberia. The high concentration of population is a convincing indicator of the development of the territory. But if one adds to what has been said the fact that a considerable proportion of the region's industrial production capital is also concentrated here, the role of this oblast in the country's national economic complex becomes clearer.

In terms of the scale and intensiveness of urbanizing processes the Kuzbass today firmly holds first place in Siberia and one of the leading positions in the Union. In 1983 almost 87 percent of the population lived in 19 cities of the oblast. And in terms of this parameter it comes behind only Murmansk Oblast in the RSFSR (92 percent) and Donetsk Oblast in the Ukraine (90 percent).¹ Incidentally, urbanization has its own expenses. With the constantly decreasing proportion of rural population the oblast is not in a position to place a sufficient quantity of food products from its own production on the tables of the city dwellers. Moreover, the mining industry

is developing intensely here, mainly the coal industry (every fifth ton of coal extracted in the country today comes from the Kuzbass). Consequently, each year a larger quantity of land is taken out of agricultural circulation.

Here, to be sure, the remarkable compensatory mechanism of our economy is at work. I have in mind the oblast's participation in the unionwide and even international division of labor, within the framework of the CEMA. Territorial division of labor corresponding to the interests of the society is one of the appreciable factors in increasing the effectiveness of production. And with the Kuzbass economy specializing in, say, coal, ferrous and nonferrous metals, chemistry and machine building, that is, in that which can be obtained here with the least expenditures, the national economy takes into account the need for the corresponding redistribution of resources.

My main subject is certain socioeconomic consequences and problems related to the process of urbanization which characterize the development of the Kuzbass during the period of the country's industrialization. This process reached its apogee in the postwar years, mainly the 1960's. Even in 1926 there were only five cities with a total population of 87,000.² There are now 19 cities in the oblast.

A city is an economical form of population. (For some reason sociologists and geographers and even regional economists fail to mention this.) We shall not raise any doubts about the expediency of the "urban" development of the city. According to predictions of specialists, the proportion of the population in large cities in the world even by the year 2000 will approach 70 percent.³ In a word, this is an irreversible process. All we can do is control it intelligently....

Before the war and also during the postwar period the building up in places where coal mines were assimilated was carried out according to the principle of mine-settlement. In the absurdity of all this, which seems obvious from today's positions, there was some rationality albeit temporary: it was simpler to solve problems of the construction of housing for minors and transportation problems had not even really arisen (or, at least, they were not so critical).

The distribution of enterprises and population in places with intensively developing mining industry—including coal—have never been simple. When selecting a site for any processing enterprise the designer has a considerably greater "degree of freedom." But the location of the mine, pit or working surface is extremely determined by nature. Hence the rigidity of the planning systems for the places for the application of labor. And, naturally, housing always comes with the latter. (The classical formula for population: labor—housing—recreation.) Incidentally, is this natural? After all, the sites in this region are not known for their good arrangement. Even having the housing next to an industrial complex does not increase the sociopsychological comfort. Nonetheless the forms of decentralized settlement have arisen basically here.

And another thing. When selecting one or another settlement it is wise to recall the consequences—social, economic and ecological. Of course the

decision is predetermined by a multitude of other factors as well. In one way or another the analysis of the process of urbanization in the oblast shows: the city is gradually disappearing as a closed structure, an isolated organism. What does one call today, for example, Prokopyevsk, which has included more than 35 settlements and whose boundaries with Kiselevsk are extremely arbitrary? Or Mezhdurechensk with its two dozen settlements?

If You Make a Mistake on the General Plan You Are in Trouble With the City

The organization of planning and design work, which is far from the best, has contributed to a considerable degree to the existing policy. This is illustrated well by the urban construction history of Mezhdurechensk, Belovo, and others as well.... A special approach should be given to that chaotic settlement which appeared after the 1950's. The urban construction outlays can be seen with the naked eye. The settlement was not provided with the modern social and cultural facilities. The possibilities of providing the necessary municipal services were limited. And right along with this is one essential social factor—the labor employment of the second and third members of the family.

And here are some considerations from the area of elementary economics. The projected time period for technical amortization of newly constructed housing is 80-100 years. Intelligent use provides for an even longer life. The coal-mining industry is projected for a period of 40-50 years, and the possibilities of subsequent utilization of the capacities that have been created are limited: the mine cannot be reprofiled for producing some other product.

Today practically all cities of the Kuzbass are a conglomerate consisting of a multitude of individual settlements with almost autonomous systems of life support. And if one somehow can explain this structure for old cities which were built before the war, it is quite inexplicable why these blunders would be allowed, for example, in postwar Mezhdurechensk. Today in the city on the books of the Kemerovougol Production Association alone there are 23 group boilers (and only two of them have complete mechanization of the stoking with solid fuel and the removal of ash). These mistakes are being eliminated even in our day with considerable difficulty and additional capital expenditures.

The "supporting framework" of the territory is a narrow belt of assimilated coal deposits along with the railroad which intersects the oblast from north to south. The breadth of this strip is only 20-25 kilometers. And "stamped" on it are 15 of the 19 cities in the oblast and more than 90 percent of its population. The settlement distortion that thus exists leads to a situation where a considerable part of the noncoal territory is almost excluded from economic circulation, mainly in the north and northeast where, incidentally, raw material mineral resources are concentrated.

The lack of integrity in the fabric of the construction of Kuzbass City ends up with many expenditures and not only social ones, but also architectural-artistic ones (good architecture in and of itself is a powerful factor in attracting and stabilizing personnel). The building up with small villages has turned out to be detrimental in another, more significant way. The

territories worked by the mines and pits are practically excluded from urban construction. And the restricted areas of forest around the places that are built up remove from industrial development considerable volumes of valuable coals, including coking coals which are in short supply.

Sadly indicative in this respect is the fate of Prokopyevsk and Kiselevsk, which were constructed on one of the richest deposits in the basin. In order for our national economy to take advantage of the resources which lie under the cities it was decided to move them to sites that had no coal. It is not easy to make the decision to remove one building, and it is a difficult task to transfer ecologically harmful enterprises, but here we are speaking about cities with a total population of 400,000 people!

The City That Never Was

The future of the large coal mines in the Kuzbass is closely related to the Yerunakovskiy Deposit (this is well demonstrated in the article by V. E. Popov et al.).⁴ Here, in addition to a number of large mines, there will also appear the first Kuzbass giant open pit. It is no accident that even the directives of the 24th CPSU Congress envisioned the beginning of the assimilation of the deposit.

The social consequences of the assimilation of this essentially virgin region are of no small interest. Forms of settlement that are new to the region of assimilated mining industry are to appear—centralized ones. A city will be created. Its plans were developed as early as 1966 by the Moscow Giprogor. The proposed name for this city is Uskat. The supertask of this centralized settlement consisted in providing for retaining personnel as a result of the high level of housing and cultural-domestic services.⁵ It would seem that everything is going well. The region is rich in construction materials. Its transportation system is close to completion. About 70 percent of the predicted supplies here are coking coal, and the technical conditions for mining it are favorable. This makes it possible to determine a fairly high planned productivity of labor.

But now almost 2 decades have passed since the time of the completion of the planning work for the Yerunakovskiy industrial region. Has the dream about a qualitatively new approach to the assimilation of a coal deposit, which is important for the basin's balance, come true? One cannot say that it has been completely forgotten. For example, innovators have managed to plan almost an entire microrayon for the future city, having spent more than 300,000 rubles on this. Incidentally, the matter has not gone any further than this. In any case the construction base and the preparation of the infrastructure for all these years have been developed in volumes and at rates that clearly do not correspond to this region's need for coal. And it is not because of the good life that a decision was made to begin the working of coal here almost by the watch method. This is being done simultaneously by two production associations. As far as the settlement of the coal miners goes, unfortunately, a variant of eye passing has been adopted. It has been decided to put up for sale to the developers of Yerunakovskiy Rayon an entire quarter in the Novoilinskiy residential area of Novokuznetsk.

Today on the scale of economic expediency the Ilinskaya area undoubtedly "outweighs" the planned Uskat: there are transportation networks, the capacities for industrial housing construction can be increased relatively easily (such a decision, incidentally, has already been made), the microrayon is included in the already existing city organism with a ready-made, although clearly inadequate, social and domestic infrastructure. In time, incidentally, it will be outgrown in any case. But what will happen to Zapsib, which is located nearby? Will the coal-mining personnel not be drawn to a no less prestigious branch--metallurgy? It also, incidentally, is experiencing a need for personnel. Moreover the Ilinskiy variant of settlement is harmful because of another kind of consequence as well. At the deposits that are being assimilated there will inevitably appear temporary cities which will subsequently be costly to remove. Not a single newly assimilated rayon, alas, has been able to avoid this. But it will hardly be possible to work such a promising deposit simply with watch teams....

To plan economic assimilation of natural resources without taking the human factor into account is the same thing as trying to keep a ship afloat with holes in its bottom. The assimilation of a new territory, even when it is surrounded by an inhabited region, is always a difficult economic task, especially if it is complicated by the specific features of the branch. It would obviously be incorrect to approach the assimilation of new coal territories with measures and models that are applied for petroleum and gas regions (where the expedition-watch construction has become widespread). As for the variants that provide only an approximate economic advantage, it should be remembered that economics, like nature, quickly begins to take vengeance for what appears to be a "victory" over it.

Centralization of settlement in regions assimilated by the mining industry is the main direction of urbanization. The need for this is dictated by the interests of more complete extraction of minerals from the earth and, the main thing, the human factor is taken into account well this way. In this connection the urban construction decisions concerning the Pavlograd Industrial Center (Western Donbass) and the Lvov-Volynsk coal basin are interesting. Centralized settlement has been approved since the beginning of the 1960's at the Estonian deposit of combustible shale (Kokhtla-Yarve). That this approach is reasonable is also shown by progressive experience in settlement in Silesia, the Ruhr and other foreign coal basins.

When Urbanization Is an Evil

Among the problems generated by the industrial development of the Kuzbass perhaps the most important is related to the ecological consequences of this process. And this is understandable as one takes into account that the three pillars of the oblast's economy are coal, chemistry and metallurgy.

The technogenic influence on the environment has already become threatening in the cities of the oblast. This pertains first and foremost to Novokuznetsk, a city of metallurgists and coal miners, and Kemerovo, where chemical enterprises predominate. Incidentally, no less harm is caused to the environment by miners, mainly open pit miners who leave "lunar" landscapes behind themselves and almost do not engage in recultivation of the disturbed

land. Other branches also are making their contribution to the violation of the ecological balance. And although recently there has been some activation of environmental protection work, there has still not been any appreciable changes for the better in this area. Most frequently there simply are no reliable scientific recommendations or the corresponding technical developments. And under these conditions the departments continue to plan increased volumes of production. For instance, the management of the Kemerovo Azot Association long ago and so far unsuccessfully asked the ministry to curtail the increase in their capacities. For the Azot workers in any event are exerting excessive ecological "pressure" on the city.

The selection of a strategy for settlement and building up of a city predetermines, in the final analysis, the level of comfort of its regions. Under the conditions of the urban systems with a high concentration of industry such as the Kuzbass system, as a result of well-thought-out planning and landscape architecture it is possible to compensate to a considerable degree for pollution of the biosphere. Unfortunately, when planning the cities of the Kuzbass these means are not always utilized. The main industrial rayon of Kemerovo began to be formed as early as the years of the first five-year plan. Recently in the opposite part of the city a second industrial rayon has been formed. And in the southern and northern parts there are also industrial enterprises. Thus the city has been enclosed by a dense industrial ring with zones of various levels of harmfulness. There is no reason for even taking into account the prevailing directions of the wind: they are all the same. Zoning is far from ideal in the largest city of the oblast—Novokuznetsk. And this under conditions when the average coefficient of occupation of industrial territories in the oblast is about 50 percent and when each year capital investments for the construction of environmental protection installations are not being assimilated.

The design-planning success of many large cities of the country is conditioned to a considerable degree by the circumstance that their zoning meets the conditions for normal living. Tolyatti, Zelenograd and Navoi were all constructed so that their residential zone would be reliably protected from the industrial zone. And is this not why the satellites of Helsinki, Tapioli and Otaniemi or, say, Chandigarh in India are so well known?

Restraint is Needed

The intensive development of industry and the unfavorable ecological consequences of this process make it necessary to regulate the growth of cities. It is becoming obvious that one cannot endlessly increase the industrial potential of the cities, regardless of how tempting it may be economically, without harm to their organism. Three of the largest cities in the oblast—Novokuznetsk, Kemerovo and Prokopetsk—have already long ago shown symptoms of disorders. These have been conditioned by a number of factors: the quality of the air, the inadequate transportation, and difficulty with water supply.... As early as 1956 the USSR government adopted a decree concerning prohibition and limitation of construction of new and expansion of existing enterprises in a number of large cities of the country (the first such limitation was introduced before the war).⁶ This list included Novokuznetsk and Kemerovo. Since that time, however, the population of each

of these cities has increased by approximately 200,000 people or more. And today Kemerovo and Novokuznetsk are displaying fairly stable tendencies toward growth.

Yet the north and northeast of the Kuzbass, which are not grasped by the process of urbanization, could become a place for the application of significant capital investments and, consequently, could develop intensely with respect to urban construction. Since the railroad mainlines are not far from there it is no accident that in the Basic Directions for the Economic and Social Development of the USSR During 1981-1985 and the Period Up to the Year 1990 notice is taken of the need "consistently to follow a line toward limiting⁷ the growth of large cities and to develop small and medium-sized cities."

But what does one do with the settlements that have already been formed? After all, about 400,000 people are living in workers' settlements with an independent administrative status. If one adds to this the population of the numerous settlements in cities whose ties to the center are frequently only symbolic, the figure is even more impressive.

Expenditures caused by inefficient settlement can be eliminated (and they are being partially eliminated) by the reconstruction of cities. But comprehensive planning of the reconstruction has not been started yet. It is necessary to gather all the "pros" and "cons" together: the future of the region, all the diversity of socioeconomic factors that predetermine the conditions for settlement. All this can be provided through in-depth architectural-sociological research. But in an oblast with a population of 3 million and high rates of organization there is not a single scientific research institution with an urban construction profile. And even the projected potential has clearly lagged behind the need. Two small institutes can hardly provide for planning of housing and social and cultural facilities in 19 cities. And there are also future regions....

Incidentally, high-quality planning and construction of a new city at the Yerunakovskiy deposit is also important because of its side effect—it would exert a favorable influence on the organization of settlement in the coal regions.

The problems of the Kuzbass were considered in the first regional program on Siberia. It envisioned the development of Kuznetsk coal and the creation on the basis of these of the largest industrial complex in the region. The implementation of this program made it possible to implement all the subsequent ones—the Angaro-Yenisey, Tyumen and, finally, the BAM. And although today public attention, along with the significant volumes of capital investments, has been attracted to newly assimilated regions in the eastern part of the country, this certainly does not mean that the forces of the veteran Siberian industry have dried up. In unionwide division of labor the oblast continues to provide vitally important positions in the national economic plan. But the Siberian giant is working under strain today and needs emergency assistance. To give in order to get—this is the reasonable model of the economic policy. A confirmation of this is the high effectiveness of investments in industry and the Kuzbass. And this is a reliable criterion.

FOOTNOTES

1. See the anniversary statistical annual, "The USSR National Economy. 1922-1982," Moscow, "Finansy i statistika", 1983.
2. Pertsik, Ye. N., "Gorod v Sibiri" [The City in Siberia], Moscow, "Mysl", 1980, p 87.
3. Khorev, B. S., "Problemy gorodov" [Problems of Cities], Moscow, "Mysl", 1975, p 75.
4. See EKO, No 4, 1984.
5. See Glotov, G. A., Pertsik, Ye. N., "Budushcheye gorodov kuzbassa," Kemerovo, 1972, p 127.
6. See Khorev, Ye. S., "Problemy gorodov," Moscow, "Mysl", 1975, p 86.
7. Materials of the 26th CPSU Congress, Moscow, Politizdat, 1981, p 138.

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SECURITY OF COMPUTERS QUESTIONED

Novosibirsk EKONOMIKA I ORGANIZATSIYA PROMYSHLENNOGO PROIZVODSTVA (EKO) in Russian No 4, Apr 86 pp 219-221

[Article by Vl. Yurovitskiy: "A Computer Is Good, But a Safe Is Better"]

[Text] Everybody is talking about computers these days. No, I do not deny that they have affected me too. It is fiendishly calculating 22 times 100 million. Beautiful. Incidentally, in secret I can say that this is not its main beauty and attractive force, but something entirely different which not every scholar would even guess. Have you seen its printout or, as the programmers call it, its "listings"? This I tell you is magnificence and rapture! You ask some young girl or even an old engineer to prepare a document and she, or he, will graph a curve, and the figures will be slanting or drop, and there are all kinds of pencil marks and erasures.... But a computer? This is the highest order! The lines are as straight as they can be, one figure comes after another like soldiers on parade, and there is not one pencil mark. You take this document in your hands and you cannot gaze at it long enough. You can either post it in the day room or place it in the red book. So the computer is a great invention of the human spirit and mind.

But this discussion is not about that. Once I was visited by some bearded young people who had been wandering around our office for a year already and you could not tear them away. And they made me a deceptive proposal. "Give us all the data you have have," they said, and we will put it in the computer. If you want to know something all you have to do is call our center and tell us and within a half hour we will deliver it to you in the best possible form."

And they showed me all kinds of tempting pictures where, like soldiers in a line, every figure looks straight ahead. And I was tempted. I was beguiled by the intelligent speeches and the orderly figure. Moreover, progress was on the threshold: it is necessary to change....

The work was fast and furious here. All the figures and paragraphs which I have had regarding the division were translated into the computer format on punch cards. I did not understand at that time that I was preparing for my demise, I was giving my own kindred things to someone foreign, a computer.

But how well everything went at first. We put everything into that machine. We created a databank and a code for it. Just like that—I would pick up the phone and within a half hour I would have before me a column of figures arranged according to the very best system. You look, you gaze in amazement, you send them to your superiors, and you file those that come in. And it was only after a certain amount of time that I found out, from afar, what I had actually done! Previously everybody came to Ivan Ivanych. "Ivan Ivanych, tell us, please, this figure, quantity, there, that percentage, the number or the date." And Ivan Ivanych, that is me, would open his safe and find there the corresponding file where everything was broken down and written out, and I would tell them. And they would listen and thank me. They would call me into the boss's office in order to receive information or to clarify a figure. In other divisions they respect you because you have the safe before you and you can open it up and find the figures they need. I had respect. Why? Because of information. And with it I was like a chief or a commander. They could not do without me and they could not bypass me. There could not even be any presidiums without me. Because with technical progress information is something very important.

But suddenly I noticed that they had begun to bypass me, nobody would come to me for guidelines, and there was no rush for information. They had begun to obtain my vital information directly from the computer, leaving me alone. And some wise ones even acquired their own terminals. They would press the button and before them they would have all my figures on the screen, like on the palm of their hand.

I tried to protest, but I was cut off quickly. They said that this was the latest system of control and that there should be no secrets in information, that anybody should have access to it quickly. Then they said that the management would be scientific and the control would be effective. Right here (and a little later) I was able to realize fully what I, silly fellow, had done. I myself had given over to a machine and to general ownership what had supported me and given me respect. I do not like this machine, but it uses my information and it has no respect for me.

Then I was completely gripped by fear. We are mortal people, we are weak, and sometimes we even meddle with the figures in the interests of the business or on the request of the bosses.... As long as everything is in the safe, if necessary, you can cover up your tracks. But now? Everything is stored on a permanent magnetic memory to which any inspector can gain access at any moment. And you no longer have anything to do. And you will know nothing, and they will come and seize all your property. This is what kind of insidious thing the computer is!

"No," I said to myself as soon as I had figured out the fine points and got a feeling for it. And I got rid of the thing myself as quickly as I could. Now I have no computers, only girls and senior engineers. And when wise and bearded people come to me I tell them politely but firmly that the information I have is altogether unsuitable for a computer, that it is impossible to automate this work since there are many subjective factors....

A computer, of course, is good, but a safe is still better!

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